

Karl Foster Warnick

Professor
Department of Electrical and Computer Engineering
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EDUCATION

Postdoc (1998-2000)
Center for Computational Electromagnetics
University of Illinois at Urbana-Champaign

Ph.D. in Electrical Engineering (Aug. 1997)
Brigham Young University, Provo, UT
Dissertation: "A Differential Forms Approach to Electromagnetics in Anisotropic Media"

B.S. in Electrical Engineering and Mathematics (Dec. 1993, Magna Cum Laude with University Honors)
Brigham Young University

EXPERIENCE

Professor (2011-present), **Associate Professor** (2006-2011) and **Assistant Professor** (2000-2006)
Department of Electrical and Computer Engineering, Brigham Young University

Visiting Professor (July-Aug. 2005 and Sep.-Dec. 2007)
Technische Universität München, Germany

Visiting Assistant Professor (1998-2000)
Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign

Co-Founder
Linear Signal, LLC (2008)

Consultant (2000-present)
Electromagnetic analysis, numerical methods, antenna design, radome analysis, microwave systems, and signal processing

PROFESSIONAL ACTIVITIES

Co-Chair of the IEEE Antennas and Propagation Society Education Committee (2014-present)
Organized Software Enabled Radio Astronomy (SERA) Workshop on Phased Array Antenna Modeling and Signal Processing, all-day hands-on tutorial workshop at BYU, Provo, UT, Oct. 24, 2016.
Organized 2016 Utah RF & Wireless Day, Provo, UT, Sep. 14, 2016.
Distinguished Lecturer for the IEEE Antennas and Propagation Society (2014-present)
Organized Special Session on Antennas and Signal Processing for Radio Astronomy, Earth, and Space Science Instruments, ICEAA 2014, Aruba
Special Session on Antennas and Sensors for Unmanned Air Systems, 2014 IEEE AP-S Symposium
Special Sessions for URSI USNC Meeting, Boulder, CO.
Organized first Utah RF & Wireless Day, Provo, UT, Sep. 6, 2013
Special Session on Imaging Arrays for Radio Astronomy, ICEAA 2012, Cape Town, South Africa
Editorial Board, Progress in Electromagnetics Research (2013-present)
Special Session Organizer, 2012 International Conference on Electromagnetics and Advanced Applications
Senior Associate Editor, IEEE Transactions on Antennas and Propagation, 2010-2014.

Advisory Board member, Large Aperture Experiment to Detect the Dark Age (LEDA), 2011-2014
Steering Committee Member and Short Courses and Workshops Chair, IEEE International Antennas and Propagation Symposium, Spokane, WA, July 2011
Member of IEEE Antenna Definitions Working Group, 2010-present, contributed significant content to the most recent IEEE Standard for Definitions of Terms for Antennas (published 2013)
General Co-Chair, Workshop on Phased Array Feeds for the Square Kilometre Array (PAFSKA2011), Provo, UT, May 25-27, 2011
General Chair, International Workshop on Phased Array Antenna Systems for Radio Astronomy, Provo, UT, May 2-5, 2010
Member of Preliminary Design Review Committee, Australian Square Kilometre Array Pathfinder (ASKAP) Analog Subsystems, 2009.
Guest Editor, Special Issue on Antennas for Next-Generation Radio Telescopes, IEEE Transactions on Antennas and Propagation, 2010.
Technical Program Co-Chair, IEEE International Antennas and Propagation Symposium, Honolulu, Hawaii, June 2007
Technical Program Committee Member, IEEE AP-S International Symposia (2006-Present)
Technical Program Committee Member, European Conference on Antennas & Propagation (2017)
Frequent Session Chair, IEEE AP-S International Symposia
Special Session Organizer, 2009 IEEE AP-S International Symposium
Book proposal reviews (6)
National Science Foundation proposal review panel member (2007, 2014)
International funding agency proposal reviews (EU, South Africa)
Frequent reviewer, *IEEE Trans. Antennas and Propagation*, *Inverse Problems*, *IEEE Trans. Geoscience and Remote Sensing*, *IEEE Trans. Microwave Theory and Techniques*, *Radio Science*, *IEEE Proceedings on Microwaves, Antennas and Propagation*, *IEEE Antennas and Wireless Propagation Letters*, etc.

DEPARTMENT AND COLLEGE COMMITTEE WORK

Department Graduate Committee Chair (2018-present)
College Fellowships Committee (2013-present)
College Rank and Status Committee (2012-2015)
Department Coordinator for Assessment and Accreditation (2002-2012)
Undergraduate Committee Member (2002-present)
Faculty Search Committee Member (2000) and Chair (2001-2003)
Department Library Committee Chair (2000)

INTERNATIONAL ACADEMIC SERVICE

PhD Dissertation Examiner, Tel Aviv University (2017), United Arab Emirates University (2017), Helsinki University of Technology (2006), Stellenbosch University (2013)

PUBLICATIONS

Books

1. K. F. Warnick, “*Numerical Methods for Engineering with MATLAB and Computational Electromagnetics Examples Second Edition*,” IET Press, 2020.
2. K. F. Warnick, R. Maaskant, M. V. Ivashina, D. B. Davidson, and B. D. Jeffs, *Phased Arrays for Radio Astronomy, Remote Sensing, and Satellite Communications*, Cambridge, UK: Cambridge University Press, 454 pages, 2018.

3. K. F. Warnick, *Numerical Methods for Engineering with MATLAB and Computational Electromagnetics Examples*, Raleigh, NC: Scitech, 343 pages, 2010.
4. K. F. Warnick, *Numerical Analysis for Electromagnetic Integral Equations*, Norwood, MA: Artech House, 219 pages, 2008.
5. K. F. Warnick and P. Russer, *Problem Solving in Electromagnetics, Microwave Circuits, and Antenna Design for Communications Engineering*, Norwood, MA: Artech House, 372 pages, 2006.

Book Chapters

1. K. F. Warnick and W. C. Chew, "Error analysis of surface integral equation methods," in W. C. Chew, J.-M. Jin, E. Michielssen, and J. Song, eds., *Fast and Efficient Algorithms in Computational Electromagnetics*, Norwood, MA: Artech House, pp. 203-278, 2001.
2. K. F. Warnick, "Network theory of antenna arrays," *Encyclopedia of Electrical and Electronics Engineering*, Wiley, in press, 2019.

Journals (student coauthors marked with *)

1. N. M. Pingel, D. J. Pisano, M. Ruzindana, M. Burnett, K. M. Rajwade, R. Black, B. Jeffs, K. F. Warnick, D. R. Lorimer, A. Roshi, R. Prestage, M. A. McLaughlin, D. Agarwal, T. Chamberlin, L. Hawkins, L. Jensen, P. Marganian, J. D. Nelson, W. Shillue, E. Smith, B. Simon, V. van Tonder, and S. White, "The commissioning of the HI observing mode of the beamformer for the cryogenically cooled focal L-band array for the GBT (FLAG)," in preparation, 2020.
2. K. F. Warnick and K. T. Selvan, "Teaching and learning electromagnetics in 2020: issues, trends, opportunities, and ideas for developing courses," *IEEE Antennas and Propagation Magazine*, Vol. 62, No. 2, pp. 24-30, Feb. 2020.
3. J. Kunzler*, J. Bartschi*, and K. F. Warnick, "Compact structure with high Tx-Rx isolation for frequency domain duplexing on printed circuit boards," *Journal of Electromagnetic Waves and Applications*, DOI: 10.1080/09205071.2020.1715267, Vol. 34, No. 3, Jan. 2020.
4. K. Chen and K. F. Warnick, "Optimizing the design of phased array speeds for survey speed," *Electronics Letters*, Vol. 56, No. 1, Jan. 2020.
5. L. Liu*, J. Diao, and K. F. Warnick, "Array antenna gain enhancement with the Poynting streamline method," *IEEE Antennas and Wireless Propagation Letters*, Vo. 19, No. 1, pp. 143-147, 2020.
6. P. Walton*, J. Cannon*, B. Damitz*, T. Downs*, D. Glick*, J. Holtom*, N. Kohls*, A. Laraway*, I. Matheson*, J. Redding*, C. Robinson*, J. Ryan*, N. Stoddard*, J. Willis*, K. F. Warnick, M. Wirthlin, D. Wilde, B. Iverson, and D. Long, "Passive CubeSats for remote inspection of space vehicles," *Journal of Applied Remote Sensing*, Vol. 13, No. 3, 2019.
7. K. M. Rajwade, D. Agarwal, D. R. Lorimer, N. M. Pingel, D. J. Pisano, M. Ruzindana, B. D. Jeffs, K. F. Warnick, A. Roshi, and M. McLaughlin, "A 21 cm survey for pulsars and transients using the Focal L-band Array for the Green Bank Telescope," *Monthly Notices of the Royal Astronomical Society*, Vol. 489, pp. 1709-1718, Aug. 2019.
8. J. Diao, L. Liu, and K. F. Warnick, "An intuitive way to understand mutual coupling effects in antenna arrays using the Poynting streamline method," *IEEE Transactions on Antennas and Propagation*, Vol. 67, No. 2, pp. 884-891, Feb. 2019.
9. R.A. Black*, B.D. Jeffs, and K. F. Warnick, "Deep, broad null formation for canceling moving RFI in radio astronomical arrays," *Journal of Astronomical Instrumentation*, DOI: 10.1142/S2251171719400038, Vol. 8, No. 1, Mar. 2019.

10. K. T. Selvan and K. F. Warnick, "A global vision for academic scholarship and professional development," Forum for Electromagnetic Research Methods and Application Technologies (FERMAT), <https://www.e-fermat.org/education/selvan-edu-2018-03/>, 2018.
11. L. R. Sahawneh*, J. K. Wikle, A. K. Roberts, J. C. Spencer, R. W. Beard, T. W. McLain, K. F. Warnick, "A ground-based sense-and-avoid system for small unmanned aircraft," *Journal of Aerospace Information Systems*, Vol. 15, No. 8, 2018.
12. A. Roshi, W. Shillue, B. Simon, K. F. Warnick, B. D. Jeffs, D. J. Pisano, R. Prestage, S. White, J. R. Fisher, M. Morgan, R. Black, M. Burnett, J. Diao, M. Ruzindana, V. van Tonder, L. Hawkins, P. Marganian, T. Chamberlin, J. Ray, N. M. Pingel, K. Rajwade, D. R. Lorimer, A. Rane, J. Castro, W. Groves, L. Jensen, J. D. Nelson, T. Boyd, A. J. Beasley, "Performance of a highly sensitive, 19-element, dual-polarization, cryogenic L-band phased-array feed on the Green Bank Telescope," *Astronomical Journal*, Vol. 155, No. 5, 202, 18 pages, Apr. 2018.
13. M. Burnett*, B. D. Jeffs, R. A. Black*, and K. F. Warnick, "Subarray processing for projection-based RFI mitigation in radio astronomical interferers," *Astronomical Journal*, Vol. 155, No. 4, 146, 9 pages, Mar. 2018.
14. J. Higgs*, D. Austin, and K. F. Warnick, "Field optimization of toroidal ion trap mass analyzers using toroidal multipoles," *International Journal of Mass Spectrometry*, Vol. 425, pp. 10-15, Feb. 2018.
15. J. Diao* and K. F. Warnick, "Practical superdirectivity with resonant screened apertures motivated by a Poynting streamlines analysis," *IEEE Transactions on Antennas and Propagation*, Vol. 66, No. 1, pp. 432-437, Jan. 2018.
16. J. Diao*, J. Kunzler, and K. F. Warnick, "Sidelobe level and aperture efficiency optimization for tiled aperiodic array antennas," *IEEE Transactions on Antennas and Propagation*, Vol. 65, No. 12, pp. 7083-7090, 2017.
17. J. Diao* and K. F. Warnick, "Antenna loss and receiving efficiency for mutually coupled arrays," *IEEE Transactions on Antennas and Propagation*, Vol. 65, No. 11, pp. 5871-5877, 2017.
18. F. Seng*, Z. Yang, R. King*, L. Shumway*, N. Stan*, A. Hammond*, K. F. Warnick, and S. Schultz, "Slab coupled optical sensor (SCOS) directional sensitivity rerouting and enhancement using dipole antennas," *Applied Optics*, Vol. 56, No. 17, pp. 4911-4916, 2017.
19. D. Semic, D. F. Williams, K. A. Remley, C.-M. Wang, C. L. Holloway, Z. Yang*, and K. F. Warnick, "Antenna efficiency measurement uncertainty in a reverberation chamber at millimeter-wave frequencies," *IEEE Transactions on Antennas and Propagation*, Vol. 65, No. 8, pp. 4209-4219, 2017.
20. A. Khoshniat, T. Yekan, R. Baktur, and K. F. Warnick, "Active integrated antenna supporting linear and circular polarizations," *IEEE Transactions on Components, Packaging and Manufacturing Technology*, Vol. 7, No. 2, pp. 238-245, Jan. 2017.
21. J. Diao* and K. F. Warnick, "Poynting streamlines, effective area shape, and the design of superdirective antennas," *IEEE Transactions on Antennas and Propagation*, Vol. 65, No. 2, Feb. 2017, pp. 861-866.
22. J. Diao* and K. F. Warnick, "On the bandwidth gap between the array feed and cluster feed regimes for broadband multifeed systems," *IEEE Transactions on Antennas and Propagation*, Vol. 64, No. 6, pp. 2207-2216, June, 2016.
23. J. M. Higgs*, B. V. Peterson, S. A. Lammert, K. F. Warnick, and D. E. Austin, "Radiofrequency trapping of ions in a pure toroidal potential distribution," *International Journal of Molecular Sciences*, Vol. 395, pp. 20-26, Feb. 2016.

24. Z. Yang* and K. F. Warnick, "Analysis and design of intrinsically dual circular polarized microstrip antennas using an equivalent circuit model and Jones matrix formulation," *IEEE Transactions on Antennas and Propagation*, Vol. 64, No. 9, pp. 3858-3868, Sep. 2016.
25. K. F. Warnick, R. Maaskant, M. V. Ivashina, D. B. Davidson, and B. D. Jeffs, "High sensitivity phased array receivers for radio astronomy," *IEEE Proceedings*, Vol. 104, No. 3, pp. 607-622, 2016, invited.
26. Z. Yang*, K. C. Browning, and K. F. Warnick, "High efficiency stacked shorted annular patch antenna feed for Ku band satellite communications," *IEEE Transactions on Antennas and Propagation*, Vol. 64, No. 6, pp. 2568-2571, June, 2016.
27. L. Belostotski, B. Veidt, K. F. Warnick, and A. Madanayake, "Low noise amplifier design characteristics for use in antenna arrays," *IEEE Transactions on Antennas and Propagation*, Vol. 63, No. 6, pp. 2508-2520, June 2015.
28. G. Cortes-Medellin, A. Vishwas, S. Parshley, D. B. Campbell, P. Perilatt, R. Black*, J. Brady*, K. F. Warnick, and B. D. Jeffs, "A fully cryogenic phased array camera for radio astronomy," *IEEE Transactions on Antennas and Propagation*, Vol. 63, No. 6, pp. 2471-2481, June, 2015.
29. L. Sahawneh*, J. Mackie*, J. Spencer*, R. W. Beard, and K. F. Warnick, "Airborne radar-based collision detection and risk estimation for small unmanned aircraft systems," *Journal of Aerospace Information Systems*, doi: 10.2514/1.I010284, 11 pages, 2015.
30. M. Khan* and K. F. Warnick, "Noise figure reduction by port decoupling for a dual circular polarized microstrip antenna," *Electronics Letters*, Vol. 50, No. 23, pp. 1662-1664, Nov. 2014.
31. M. Elmer*, B. D. Jeffs, and K. F. Warnick, "Reducing relative gain and noise response variations for phased array feed imaging of radio astronomical sources," *IEEE Transactions on Antennas and Propagation*, Vol. 62, No. 12, pp. 6067-6080, Sep. 2014.
32. M. Khan, Z. Yang, and K. F. Warnick, "Dual circular polarized high efficiency antenna for Ku band satellite communication," *IEEE Antennas and Wireless Propagation Letters*, Vol. 13, pp. 1624-1627, Aug. 2014.
33. M. Morin*, Z. Yang*, and K. F. Warnick, "Compact dual circularly polarized 'eleven' feed over EBG for reflector antennas," *Forum for Electromagnetic Research Methods and Application Technologies*, 4 pages, 2014.
34. K. F. Warnick and P. Russer, "Differential forms and electromagnetic field theory," *Progress in Electromagnetics Research*, Vol. 148, pp. 83-112, 2014, invited paper for Commemorative Collection on 150 Years of Maxwell's Equations.
35. Z. Yang* and K. F. Warnick, "Multiband dual-polarization high-efficiency array feed for Ku/Reverse Band satellite communications," *IEEE Antennas and Wireless Propagation Letters*, Vol. 13, pp. 1325-1328, July, 2014.
36. P. DeFranco*, J. Mackie*, M. Morin*, and K. F. Warnick, "Bio-inspired electromagnetic orientation for UAVs in a GPS-denied environment using MIMO channel sounding," *IEEE Transactions on Antennas and Propagation*, Vol. 62, No. 10, pp. 5250-5259, 2014.
37. B. S. Blankenagel*, S. Khadka*, A. R. Hawkins, K. F. Warnick, and B. A. Mazzeo, "Radio-frequency microfluidic interferometer in printed circuit board process," *Microwave and Optical Technology Letters*, Vol. 55, No. 7, pp. 1616-1618, 2013.
38. Y. Wu, K. F. Warnick, and C. Jin, "Design study of an L-band phased array feed for wide-field surveys and vibration compensation on FAST," *IEEE Transactions on Antennas and Propagation*, Vol. 61, No. 6, pp. 3026-3033, June, 2013.

39. K. F. Warnick, R. B. Gottula*, S. Shrestha*, and J. Smith*, "Optimizing power transfer efficiency and bandwidth for near field communication systems," *IEEE Transactions on Antennas and Propagation*, Vol. 61, No. 2, pp. 927-933, Feb. 2013.
40. M. Elmer*, B. D. Jeffs, and K. F. Warnick, Long-term calibration stability of a radio astronomical phased array feed, *Astronomical Journal*, Vol. 145, No. 24, 11 pages, Dec. 2012.
41. S. Wijnholds, M. Ivashina, R. Maaskant, T. Webb*, and K. F. Warnick, "Polarimetry with phased array antennas: sensitivity and polarimetric performance using unpolarized sources for calibration," *IEEE Transactions on Antennas and Propagation*, Vol. 60, No. 10, pp. 4688-4698, Oct. 2012.
42. K. F. Warnick, M. Ivashina, S. Wijnholds, and R. Maaskant, "Polarimetry with phased array antennas: theoretical framework and definitions," *IEEE Transactions on Antennas and Propagation*, Vol. 60, No. 1, pp. 184-196, 2012.
43. M. Elmer*, B. D. Jeffs, and K. F. Warnick, "Beamformer design methods for radio astronomical phased array feeds," *IEEE Transactions on Antennas and Propagation*, Vol. 60, No. 2, pp. 903-914, 2012.
44. J. Landon*, B.D. Jeffs, and K.F. Warnick, "Model-based subspace projection beamforming for deep interference nulling," *IEEE Transactions on Signal Processing*, Vol. 60, No. 3, pp. 1215-1228, 2012.
45. R. Maaskant, M. V. Ivashina, S. J. Wijnholds, and K. F. Warnick, "Efficient prediction of array element patterns using physics-based expansions and a single far-field measurement," *IEEE Transactions on Antennas and Propagation*, Vol. 60, No. 8, pp. 3614-3621, 2012.
46. K. F. Warnick, D. Carter*, T. Webb*, J. Landon*, M. Elmer*, and B. D. Jeffs, "Design and characterization of an active impedance matched low noise phased array feed," *IEEE Transactions on Antennas and Propagation*, Vol. 59, No. 6, pp. 1876-1885, 2011.
47. T. Sorensen* and K. F. Warnick, "Image quality for diffraction tomography, holographic backpropagation, and regularized sampling with noisy data," *Inverse Problems in Science and Engineering*, Vol. 19, No. 2, pp. 203-221, Mar. 2011.
48. H. Odabasi*, F. Teixeira, and K. F. Warnick, "Anisotropic metamaterial blueprints for cladding control of waveguide modes," *Journal of the Optical Society of America B*, Vol. 27, No. 8, pp. 1603-1609, 2010.
49. K. F. Warnick, M. Ivashina, R. Maaskant*, and B. Woestenburger, "Unified definitions of efficiencies and system noise temperature for receiving arrays," *IEEE Transactions on Antennas and Propagation*, Vol. 58, No. 6, pp. 2121-2125, June, 2010.
50. J. Landon*, M. Elmer*, J. Waldron*, D. Jones*, A. Stemmons*, B. D. Jeffs, K. F. Warnick, J. R. Fisher, and R. D. Norrod, "Phased array feed calibration, beamforming, and imaging," *Astronomical Journal*, Vol. 139, pp. 1154-1167, Mar. 2010.
51. B. D. Jeffs and K. F. Warnick, "Spectral bias in adaptive beamforming with narrowband interference," *IEEE Transactions on Signal Processing*, Vol. 57, No. 4, pp. 1373-1382, Apr. 2009.
52. X. Sun*, D. Li*, A. T. Woolley, P. B. Farnsworth, H. D. Tolley, K. F. Warnick, and M. L. Lee, "Bilinear electric field gradient focusing," *Journal of Chromatography A*, Vol. 1216, No. 37, pp. 6532-6538, 2009.
53. K. F. Warnick, E. E. M. Woestenburger, L. Belostotski, and P. Russer, "Minimizing the noise penalty due to mutual coupling for a receiving array," *IEEE Transactions on Antennas and Propagation*, Vol. 57, No. 6, pp. 1634-1644, June, 2009.
54. X. Sun*, P. B. Farnsworth, H. D. Tolley, K. F. Warnick, A. T. Woolley, and M. L. Lee, "Performance optimization in electric field gradient focusing," *Journal of Chromatography A*, Vol. 1216, pp. 159-164, 2009.

55. K. F. Warnick and B. D. Jeffs, "Efficiencies and system temperature for a beamforming array," *IEEE Antennas and Wireless Propagation Letters*, Vol. 7, pp. 565-568, 2008.
56. B. D. Jeffs and K. F. Warnick, "Bias corrected PSD estimation for an adaptive array with moving interference," *IEEE Transactions on Signal Processing*, Vol. 56, No. 7, doi:10.1109/TSP.2008.919637, pp. 3108-3121, July, 2008.
57. B. D. Jeffs, K. F. Warnick, J. Landon*, J. Waldron*, D. Jones*, J. R. Fisher, and R. D. Norrod, "Signal processing for phased array feeds in radio astronomical telescopes," *IEEE Journal of Selected Topics in Signal Processing*, Vol. 2, No. 5, pp. 635-646, Oct. 2008.
58. S. Lin*, Y. Li*, A. T. Woolley, M. L. Lee, H. D. Tolley, and K. F. Warnick, "Programmed elution and peak profiles in electric field gradient focusing," *Electrophoresis*, Vol. 29, No. 5, pp. 1058-1066, Mar. 2008.
59. J. R. Nagel*, K. F. Warnick, B. D. Jeffs, J. R. Fisher, and R. Bradley, "Experimental verification of radio frequency interference mitigation with a focal plane array feed," *Radio Science*, Vol. 42, RS6013, doi:10.1029/2007RS003630, 2007.
60. X. Sun*, P. B. Farnsworth, A. T. Woolley, H. D. Tolley, K. F. Warnick, and M. L. Lee, "Poly(ethylene glycol)-functionalized devices for electric field gradient focusing," *Analytical Chemistry*, Vol. 80, No. 2, pp. 451-460, 2007.
61. J. T. Johnson, K. F. Warnick, P. Xu*, and L. Tsang, "On the geometrical optics (Hagfors' Law) and physical optics approximations for scattering from exponentially correlated surfaces," *IEEE Transactions on Geoscience and Remote Sensing*, Vol. 45, No. 8, pp. 2619-2629, Aug. 2007.
62. K. F. Warnick and M. A. Jensen, "Optimal noise matching for mutually-coupled arrays," *IEEE Transactions on Antennas and Propagation*, Vol. 55, No. 6, pp. 1726-1731, June 2007.
63. K. F. Warnick and B. D. Jeffs, "Gain and aperture efficiency for a reflector antenna with an array feed," *IEEE Antennas and Wireless Propagation Letters*, Vol. 5, No. 1, pp. 499-502, 2006.
64. K. F. Warnick and P. Russer, "Green's theorem in electromagnetic field theory," *Proceedings of the European Microwave Association*, Vol. 2, No. 2, pp. 141-146, June 2006.
65. K. F. Warnick and P. Russer, "Two, three, and four-dimensional electromagnetics using differential forms," *Turkish Journal of Electrical Engineering and Computer Sciences*, Vol. 14, No. 1, pp. 153-172, 2006.
66. F. W. Millet*, K. F. Warnick, J. R. Nagel*, and D. V. Arnold, "Physical optics-based electromagnetic bias theory with surface height-slope cross-correlation and hydrodynamic modulation," *IEEE Transactions on Geoscience and Remote Sensing*, Vol. 44, No. 6, pp. 1470-1483, June 2006.
67. K. F. Warnick, "An intuitive error analysis for FDTD and comparison to MOM," *IEEE Antennas and Propagation Magazine*, Vol. 47, No. 6, pp. 111-115, Dec. 2005.
68. A. J. Poulsen*, B. D. Jeffs, K. F. Warnick, and J. R. Fisher, "Programmable real-time cancellation of GLONASS interference with the Green Bank Telescope," *Astronomical Journal*, Vol. 130, pp. 2916-2927, Dec. 2005.
69. F. W. Millet*, K. F. Warnick, and D. V. Arnold, "Electromagnetic bias at off-nadir incidence angles," *Journal of Geophysical Research-Oceans*, Vol. 110, No. C09017, doi:10.1029/2004JC002704, 13 pages, 2005.
70. C. K. Hansen*, K. F. Warnick, B. D. Jeffs, J. R. Fisher, and R. Bradley, "Interference mitigation using a focal plane array," *Radio Science*, Vol. 40, No. 5, doi:10.1029/2004RS003138, 14 pages, June 2005.

71. K. F. Warnick and M. A. Jensen, "Effect of mutual coupling on interference mitigation with a focal plane array," *IEEE Transactions on Antennas and Propagation*, Vol. 53, No. 6, pp. 2490-2498, Aug. 2005.
72. C. P. Davis* and K. F. Warnick, "On the physical meaning of the Sobolev norm in error estimation," *Journal of the Applied Computational Electromagnetics Society*, Vol. 20, No. 2, pp. 144-150, July 2005.
73. K. F. Warnick, F. W. Millet*, and D. V. Arnold, "Physical and geometrical optics for 2D rough surfaces with power-law height spectra," *IEEE Transactions on Antennas and Propagation*, Vol. 53, No. 3, pp. 922-932, Mar. 2005.
74. B. D. Jeffs, L. Li*, and K. F. Warnick, "Auxiliary assisted interference mitigation for radio astronomy arrays," *IEEE Transactions on Signal Processing*, Vol. 53, No. 2, pp. 439-451, Feb. 2005.
75. C. P. Davis* and K. F. Warnick, "Error analysis of 2D MoM for MFIE/EFIE/CFIE based on the circular cylinder," *IEEE Transactions on Antennas and Propagation*, Vol. 53, no. 1, pp. 321-331, Jan. 2005.
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77. K. F. Warnick and W. C. Chew, "Error analysis of the moment method," *IEEE Antennas and Propagation Magazine*, Vol. 46, No. 6, Dec. 2004 (invited).
78. C. P. Davis* and K. F. Warnick, "High order convergence with a low order discretization of the 2D MFIE," *IEEE Antennas and Wireless Propagation Letters*, Vol. 3, No. 1, pp. 355-358, 2004.
79. M. A. Jensen and K. F. Warnick, "Comment on 'Coulomb torque---a general theory for electrostatic forces in many body systems,'" *Journal of Physics A: Mathematical and General*, Vol. 37, No. 24, pp. 6415-6417, 2004.
80. F. W. Millet* and K. F. Warnick, "Validity of rough surface backscattering models," *Waves in Random Media*, Vol. 14, No. 3, pp. 327-347, July 2004. Listed on featured articles webpage, <http://www.iop.org/EJ/journal/-page=featured/0959-7174/1>, 6/29/2004.
81. F. W. Millet*, D. V. Arnold, K. F. Warnick, and J. Smith*, "Electromagnetic bias estimation using *in situ* and satellite data part I: RMS long wave slope," *Journal of Geophysical Research-Oceans*, Vol. 108, No. C2, 3040, 10 pages, 2003.
82. F. W. Millet*, D. V. Arnold, P. Gaspar, K. F. Warnick, and J. Smith*, "Electromagnetic bias estimation using *in situ* and satellite data part II: A nonparametric approach," *Journal of Geophysical Research-Oceans*, Vol. 108, No. C2, 3041, 10 pages, 2003.
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92. J. Landon, B. D. Jeffs, and K. F. Warnick, "Deep nulling interference cancelation for phased array feeds," International Workshop on Phased Array Antenna Systems for Radio Astronomy, Provo, UT, May 3-5, 2010.
93. R. Norrod, J. R. Fisher, B. Jeffs, and K. F. Warnick, "Steps toward a cryogenic L-band phased array feed for reflector antennas," International Workshop on Phased Array Antenna Systems for Radio Astronomy, Provo, UT, May 3-5, 2010.

94. K. F. Warnick, D. Carter, T. Webb, B. D. Jeffs, J. Landon, M. Elmer, J. R. Fisher, and R. Norrod, "Sensitivity optimization and signal processing for the BYU/NRAO L-band phased array feed," URSI National Radio Science Meeting, Boulder, CO, Jan. 6-9, 2010 (invited).
95. F. L. Teixeira and K. F. Warnick, "Metamaterial claddings for homotopic control of waveguide modes," Proceedings of IEEE Antennas and Propagation Society International Symposium, Charleston, SC, June 1-5, 2009.
96. K. F. Warnick, "Optimal noise matching for a phased array feed," Proceedings of IEEE Antennas and Propagation Society International Symposium, Charleston, SC, June 1-5, 2009.
97. K. F. Warnick, "MIMO communications and inverse scattering," Proceedings of IEEE Antennas and Propagation Society International Symposium, Charleston, SC, June 1-5, 2009.
98. K. F. Warnick, B. D. Jeffs, J. Landon, J. Waldron, D. A. Jones, R. Fisher, and R. Norrod, "Beamforming and imaging with the BYU/NRAO L-band phased array feed," Proceedings of the 13th International Symposium on Antenna Technology and Applied Electromagnetics and the Canadian Radio Sciences Meeting (ANTEM/URSI), Banff, AB, Canada, Feb. 15-18, 2009. Invited.
99. K. F. Warnick, B. D. Jeffs, J. Landon, J. Waldron, D. Jones, R. Fisher, and R. Norrod, "BYU/NRAO 19-element phased array feed modeling and experimental results," URSI General Assembly, Chicago, IL, Aug. 8-15, 2008. Invited.
100. M. J. Elmer, J. Landon, B. D. Jeffs, K. F. Warnick, R. Fisher, and R. Norrod, "Optimizing phased array feeds to reduce elevation dependant spillover noise in radio telescopes," URSI General Assembly, Chicago, IL, Aug. 8-15, 2008 (invited).
101. J. C. Landon, B. D. Jeffs, K. F. Warnick, J. R. Fisher, R. D. Norrod, "Improved low INR interference cancellation using phased array feeds," URSI General Assembly, Chicago, IL, Aug. 8-15, 2008 (invited).
102. J. S. Waldron, D. A. Jones, K. F. Warnick, and B. D. Jeffs, "Effects of focal plane array offset and beam steering on sensitivity," Proceedings of IEEE Antennas and Propagation Society International Symposium, San Diego, CA, July 5-12, 2008.
103. K. F. Warnick and P. Russer, "Quantifying the noise penalty for a mutually coupled array," Proceedings of IEEE Antennas and Propagation Society International Symposium, San Diego, CA, July 5-12, 2008.
104. D. A. Jones, K. F. Warnick, B. D. Jeffs, J. Landon, and J. Waldron, "Modeled and measured mutual impedances, element patterns, and sensitivity for a 19 element focal plane array," Proceedings of IEEE Antennas and Propagation Society International Symposium, San Diego, CA, July 5-12, 2008.
105. C. Ullrich, K. F. Warnick, and P. Russer, "Radiation from a monopole antenna in an aperture backed by an absorbing body using a hybrid MoM/UTD approach," Proceedings of IEEE Antennas and Propagation Society International Symposium, San Diego, CA, July 5-12, 2008.
106. W. Chew, C. Davis, K. F. Warnick, Z. Nie, S. Yan, and L. Gurel, "EFIE and MFIE, why the difference?," Proceedings of IEEE Antennas and Propagation Society International Symposium, San Diego, CA, July 5-12, 2008.
107. K. F. Warnick, D. Jones, B. D. Jeffs, and M. A. Jensen, "Noise penalty due to mutual coupling for receive arrays," URSI National Radio Science Meeting, Boulder, CO, Jan. 3-6, 2008.
108. J. Landon, D. Jones, B. D. Jeffs, K. F. Warnick, R. Fisher, and R. Norrod, "Interference cancellation and sensitivity optimization using an L-band focal plane array on the Green Bank 20m Telescope," URSI National Radio Science Meeting, Boulder, CO, Jan. 3-6, 2008.

109. Y. Li, S.-L. Lin, K. F. Warnick, H. D. Tolley, M. L. Lee, "Programmed elution and peak profiles in electric field gradient focusing," Pittcon, New Orleans, LA, Mar. 1-7, 2008.
110. K. F. Warnick and M. A. Jensen, "Signal and noise analysis of small antennas terminated with high impedance amplifiers," Proceedings of 2nd European Conference on Antennas and Propagation, Edinburgh, UK, Nov. 11-16, 2007.
111. B.D. Jeffs and K.F. Warnick, "Bias corrected PSD estimation with an interference canceling array," Proc. of IEEE International Conf. Acous., Speech, and Sig. Proc., ICASSP-2007, Honolulu, HI, vol. II, pp 1145-1148, April 15-20, 2007.
112. K. F. Warnick, J. Waldron, J. Landon, M. Lilrose, and B. D. Jeffs, "Experimental results on interference mitigation with a 19 element array feed," Proceedings of 2nd European Conference on Antennas and Propagation, Edinburgh, UK, Nov. 11-16, 2007.
113. K. F. Warnick and A. F. Peterson, "3D MFIE accuracy improvement using regularization," Proceedings of IEEE Antennas and Propagation Society International Symposium, Honolulu, HI, June 10-15, 2007.
114. K. F. Warnick and M. A. Jensen, "Optimal noise matching condition for mutually coupled antenna arrays," Proceedings of IEEE Antennas and Propagation Society International Symposium, Honolulu, HI, June 10-15, 2007.
115. T. Sorensen and K. F. Warnick, "Inverse scattering image quality as a function of SNR," Proceedings of IEEE Antennas and Propagation Society International Symposium, Honolulu, HI, June 10-15, 2007.
116. J. R. Nagel, M. A. Lillrose, K. F. Warnick, and B. D. Jeffs, "Prototype platform for array feed development," Proceedings of USNC/URSI National Radio Science Meeting, Albuquerque, NM, July 9-14, 2006.
117. K. F. Warnick and P. Russer, "Solving Maxwell's equations using fractional wave equations," Proceedings of IEEE Antennas and Propagation Society International Symposium, Albuquerque, NM, July 9-14, 2006.
118. K. F. Warnick and M. A. Jensen, "Mutual coupling analysis of a focal plane array feed," Proceedings of IEEE Antennas and Propagation Society International Symposium, Washington, D.C., July 3-8, 2005.
119. C. P. Davis and K. F. Warnick, "3D MFIE solution improvement by regularization," Proceedings of IEEE Antennas and Propagation Society International Symposium, Washington, D.C., July 3-8, 2005.
120. C. P. Davis and K. F. Warnick, "2D MFIE solution improvement by regularization," IEEE/ACES International Conference on Wireless Communications and Applied Computational Electromagnetics, Honolulu, Hawaii, April 3-7, 2005.
121. C. K. Hansen, K. F. Warnick, B. D. Jeffs, J. R. Fisher, and R. Bradley, "Interference mitigation using an array feed," Workshop on Mitigation of Radio Frequency Interference in Radio Astronomy, Penticton, BC, Canada, July, 2004.
122. C. K. Hansen, K. F. Warnick, and B. D. Jeffs, "Interference cancellation using an array feed design for radio telescopes," Proceedings of IEEE Antennas and Propagation Society International Symposium, Monterey, CA, pp. 539-542, June 20-25, 2004.
123. C. P. Davis and K. F. Warnick, "The physical meaning of the Sobolev norm in error estimation," Proceedings of IEEE Antennas and Propagation Society International Symposium, Monterey, CA, pp. 3377-3380, June 20-25, 2004.

124. C. P. Davis and K. F. Warnick, "Error analysis of moment method solutions for 3D scattering problems," Proceedings of USNC/URSI National Radio Science Meeting, Monterey, CA, p. 280, June 20-25, 2004.
125. K. F. Warnick, F. W. Millet, and D. V. Arnold, "Validity of backscattering models for Gaussian and power-law rough surfaces," Proceedings of Progress in Electromagnetics Research Symposium, Pisa, Italy, March 28-31, 2004. Invited.
126. K. F. Warnick and D. V. Arnold, "Experimental measurements of off-nadir EM bias," Topex/Poseidon-Jason-1 Science Working Team Meeting, poster/presentation, Arles, France, Nov. 18-21, 2003.
127. K. F. Warnick and D. V. Arnold, "Correlation of residual EM bias error with sea surface parameters," Topex/Poseidon-Jason-1 Science Working Team Meeting, poster/presentation, Arles, France, Nov. 18-21, 2003.
128. C. Hansen, K. F. Warnick, and B. D. Jeffs, "Adaptive interference cancellation using an array feed design for radio telescopes," Proceedings of the USNC/CNC/URSI North American Radio Science Meeting, Columbus, OH, p. 642, June 22-27, 2003.
129. A. Poulsen, B.D. Jeffs, C. Hansen, K. F. Warnick, and R. Fisher, "Real-time adaptive cancellation of GLONASS interference in OH signal observations at the Green Bank telescope," Proceedings of the USNC/CNC/URSI North American Radio Science Meeting, Columbus OH, p. 641, June 22-27, 2003
130. C. P. Davis and K. F. Warnick, "Convergence rates of 2D moment method solutions for the MFIE and EFIE," Proceedings of IEEE Antennas and Propagation Society International Symposium, Columbus, OH, Vol. 2, pp. 1080-1083, June 22-27, 2003.
131. F. W. Millet and K. F. Warnick, "Validity study of rough surface scattering models," Proceedings of IEEE Antennas and Propagation Society International Symposium, Columbus, OH, pp. 565-568, June 22-27, 2003.
132. B. D. Jeffs, K. F. Warnick, and L. Li, "Improved interference cancellation in synthesis array radio astronomy imaging using auxiliary antennas," Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing, Hong Kong, pp. V77-V80, May, 2003.
133. Q. Wang, Y. Liu, S-L. Lin, J. Liu, H. D. Tolley, K. F. Warnick and M. L. Lee, "Electromobility focusing of proteins in small channels," 26th International Symposium on Capillary Chromatography and Electrophoresis, Las Vegas, NV, May 18-22, 2003.
134. K. F. Warnick and D. V. Arnold, "Verification of nonparametric SSB models and progress in theoretical bias studies," Jason-1/TOPEX/Poseidon Scientific Working Team Meeting, New Orleans, LA, p, 55, 21-23 October, 2002.
135. F. W. Millet, K. F. Warnick and D. V. Arnold, "Refining electromagnetic bias estimation," Proceedings of IEEE Geoscience and Remote Sensing Symposium, June, 2002, Vol. 4, pp. 1980-1982.
136. K. F. Warnick and W. C. Chew, "Error analysis of scattering amplitudes and RCS," Proceedings of URSI National Radio Science Meeting, San Antonio, TX, p. 598, June 16-21, 2002.
137. K. F. Warnick, F. W. Millett, and D. V. Arnold, "Verification of nonparametric crossover difference SSB models," Jason-1 Scientific Working Team Meeting, Biarritz, France, 10-12 June, 2002.
138. K. F. Warnick, F. W. Millett, and D. V. Arnold, "Theoretical sea state bias model based on RMS slope," poster presentation, Jason-1 Scientific Working Team Meeting, Biarritz, France, 10-12 June, 2002.

139. K. F. Warnick, F. W. Millett, and D. V. Arnold, "Incidence angle dependence of EM bias," poster presentation, Jason-1 Scientific Working Team Meeting, Biarritz, France, 10-12 June, 2002.
140. S-L. Lin, Q. Wang, H. D. Tolley, K. F. Warnick and M. L. Lee, "Electromobility focusing of proteins in a Dialysis Hollow Fiber," 25th International Symposium on Capillary Chromatography, Riva del Garda, Italy, May 13-17, 2002.
141. K. F. Warnick and W. C. Chew, "High frequency asymptotic representation of the fast multipole method translation operator," Proceedings of URSI National Radio Science Meeting, Boston, MA, p. 328, July 8-13, 2001.
142. M. Brandfass, A. D. Lantermann, N. B. Shelton, and K. F. Warnick, "Comparison of Colton-Kirsch linear sampling with linearized tomographic inverse scattering," Proceedings of URSI National Radio Science Meeting, Boston, MA, p. 286, July 8-13, 2001.
143. Q. Wang, R. S. Shah, K. F. Warnick, F. R. Callejas, and M. L. Lee, "Hollow fiber-based electromobility focusing for proteins," 24th International Symposium on Capillary Chromatography and Electrophoresis, Las Vegas, Nevada, May 20-24, 2001.
144. K. F. Warnick and W. C. Chew, "Regulated kernel for the electric field integral equation," Proceedings of IEEE Antennas and Propagation Symposium, Salt Lake City, UT, vol. 4, p. 2310-2313, July 16-21, 2000.
145. F. Millett, D. V. Arnold, K. F. Warnick, and W. K. Melville, "Electromagnetic bias estimation using *in situ* and satellite data," TOPEX/Poseidon Jason-1 Scientific Working Team Meeting, Miami Beach, FL, 15-17 Nov., 2000.
146. K. F. Warnick and W. C. Chew, "Accuracy of the higher order moment method," Proceedings of IEEE Antennas and Propagation Symposium, Salt Lake City, UT, vol. 1, p. 464-467, July 16-21, 2000.
147. K. F. Warnick and W. C. Chew, "A pedestrian introduction to the accuracy and convergence of integral equation methods," Proceedings of URSI National Radio Science Meeting, Salt Lake City, UT, p. 351, July 16-21, 2000.
148. K. F. Warnick and W. C. Chew, "Accuracy of the method of moments for the cylinder," Proceedings of URSI National Radio Science Meeting, Orlando, FL, p. 84, Jul. 11-16, 1999.
149. K. F. Warnick and W. C. Chew, "Spectral multigrid for the electric field integral equation," Proceedings of URSI National Radio Science Meeting, Orlando, FL, p. 9, Jul. 11-16, 1999.
150. K. F. Warnick and W. C. Chew, "Accuracy and conditioning of the method of moments for the 2D EFIE," 15th Annual Review of Progress in Applied Computational Electromagnetics, Monterey, CA, Mar. 15-20, 1999.
151. K. F. Warnick and D. V. Arnold, "Generalization of the geometrical optics scattering limit for a rough conducting surface," Proceedings of International Geoscience and Remote Sensing Symposium, Seattle, WA, July 6-10, 1998.
152. K. F. Warnick and D. V. Arnold, "Finite frequency generalization of the geometrical optics rough surface scattering coefficient," Proceedings of IEEE Antennas and Propagation Symposium, Atlanta, GA, pp. 1078-1080, June 21-26, 1998.
153. K. F. Warnick and D. V. Arnold, "Green forms for anisotropic, inhomogeneous media," Proceedings of Progress in Electromagnetics Research Symposium, p. 475, Cambridge, Mass., July 7-11, 1997.
154. D. V. Arnold, K. F. Warnick, and R. H. Selfridge, "Differential forms as a tool for electromagnetic theory," Proceedings of Progress in Electromagnetics Research Symposium, p. 466, Cambridge, Mass., July 7-11, 1997.

155. K. F. Warnick, D. V. Arnold, and R. H. Selfridge, "Electromagnetics made easy: differential forms as a teaching tool," *Frontiers in Education Proceedings*, Salt Lake City, UT, Nov. 1996.
156. K. F. Warnick, D. V. Arnold, and R. H. Selfridge, "Differential forms in electromagnetic field theory," *Proceedings of IEEE Antenna Propagation Symposium*, pp. 1474-1477, Baltimore, Maryland, July, 1996.
157. R. H. Selfridge, K. F. Warnick, D. V. Arnold, "Enhancing the teaching of electromagnetics using differential forms," *Annual Conference Proceedings of the ASEE*, Washington, D.C., June, 1996.
158. K. F. Warnick and D. V. Arnold, "Electromagnetic Green functions using differential forms," *Proceedings of Progress in Electromagnetics Research Symposium*, p. 943, Seattle, Washington, July 24-28, 1995.
159. K. F. Warnick, R. H. Selfridge and D. V. Arnold, "Electromagnetic boundary conditions using differential forms," *Proceedings of Progress in Electromagnetics Research Symposium*, p. 1106, Seattle, Washington, July 24-28, 1995.
160. D. V. Arnold, R. H. Selfridge and K. F. Warnick, "Teaching electrodynamics using differential forms," *Proceedings of Progress in Electromagnetics Research Symposium*, p. 939, Seattle, Washington, July 24-28, 1995.
161. R. H. Selfridge, D. V. Arnold and K. F. Warnick, "Teaching electrostatics and magnetostatics using differential forms," *Proceedings of Progress in Electromagnetics Research Symposium*, p. 940, Seattle, Washington, July 24-28, 1995.

Invited Lectures

1. K. F. Warnick, "High efficiency phased array antennas for radio astronomy, remote sensing, and satellite communications," *Pontifical Catholic University of Rio de Janeiro, Brazil*, May 30, 2019.
2. K. F. Warnick, "100 years of phased array antenna modeling and design: from the array factor to network theory and array signal processing," *Federal University of Campina Grande, Brazil*, May 27, 2019.
3. K. F. Warnick, "High efficiency phased array antennas for radio astronomy, remote sensing, and satellite communications; overview of IEEE AP-S education activities and initiatives," *Workshop on Antenna Challenges in Current & Future Applications, Cairo, Egypt*, Jan. 29-31, 2019.
4. K. F. Warnick, "100 years of phased array antenna modeling and design: from the array factor to network theory and array signal processing," *IEEE Antennas and Propagation Society Distinguished Lecture, University of Cassino*, June 5, 2018.
5. K. F. Warnick, "100 years of phased array antenna modeling and design: from the array factor to network theory and array signal processing", *IEEE Antennas and Propagation Society Distinguished Lecture, BEE Week Antennas and Propagation Day, University of Bordeaux*, Nov. 17, 2017.
6. K. F. Warnick, "100 years of phased array antenna modeling and design: from the array factor to network theory and array signal processing," *IEEE Antennas and Propagation Society Distinguished Lecture, KUST University, Kochi, India*, Sep. 25, 2017.
7. K. F. Warnick, "Research frontiers in phased array antennas for radio astronomy," *IEEE Antennas and Propagation Society Distinguished Lecture, Anna University, Chennai, India*, Sep. 21, 2017.
8. K. F. Warnick, "100 years of phased array antenna modeling and design: from the array factor to network theory and array signal processing," *IEEE Antennas and Propagation Society Distinguished Lecture, SSN University, Chennai, India*, Sep. 21, 2017.
9. K. F. Warnick, "Network theory, antenna arrays, noise, mutual coupling, and array signal processing," *IEEE Antennas and Propagation Society Distinguished Lecture, Albuquerque, NM*, Mar. 16, 2017.

10. K. F. Warnick, "High Efficiency Phased Array Receivers for Satellite Communications," IEEE Coastal Los Angeles Section Technical Symposium (CLASTECH), invited keynote, Oct. 28, 2016.
11. K. F. Warnick, "High Efficiency Phased Array Receivers for Radio Astronomy, Remote Sensing, and Satellite Communications," IEEE Antennas and Propagation Society Distinguished Lecture, University of Colorado Colorado Springs, Sep. 9, 2016.
12. K. F. Warnick, "New IEEE Standard Terms and Figures of Merit for Active Antenna Arrays," University of Colorado Boulder, Sep. 8, 2016.
13. K. F. Warnick, "High efficiency phased arrays for radio astronomy, remote sensing, and satellite communications," Commonwealth Scientific and Industrial Research Organization (CSIRO), Colloquium, July 20, 2016.
14. K. F. Warnick, "Ultra-high efficiency phased arrays for astronomy, remote sensing, and satellite communications," IEEE South African IEEE Joint AP/MTT/EMC Chapter Conference, Plenary lecture, July 28, 2016.
15. K. F. Warnick, "Network theory, antenna arrays, noise theory, mutual coupling, and array signal processing," University of Cape Town, Riana Geschke Research Group, July 27, 2016.
16. K. F. Warnick, "Research frontiers in phased array antennas for radio astronomy," IEEE Antennas and Propagation Society Distinguished Lecture, Melbourne IEEE Antennas and Propagation Society Section, Melbourne, FL, May 77, 2016.
17. K. F. Warnick, "Microwave networks, noise theory, and array signal processing," Lund University, Mar. 17, 2016.
18. K. F. Warnick, "Ultra-high efficiency phased arrays for astronomy, remote sensing, and satellite communications," Swedish Microwave Days, Plenary lecture, March 16, 2016.
19. K. F. Warnick, "Tutorial on Phased Array Feeds," NRC-DRAO PAF Workshop, Penticton, Canada, Nov. 4-6, 2015.
20. K. F. Warnick, "Ultra-high efficiency phased arrays for astronomy, remote sensing, and satellite communications," Army Research Lab, Adelphi, MD, Feb. 12, 2015.
21. K. F. Warnick, "Ultra-high efficiency phased arrays for astronomy and satellite communications," Antennas Mini-symposium, Tel Aviv University, Israel, Nov. 6, 2014.
22. K. F. Warnick, "The updated 2013 IEEE standard for antenna terms: figures of merit for active antenna arrays," University of Illinois at Urbana-Champaign, Apr. 29, 2014.
23. K. F. Warnick, "Tutorial: phased array antennas for radio astronomy," URSI National Radio Science Meeting, Boulder, CO, Jan. 9-12, 2013.
24. K. F. Warnick, "Low cost, high efficiency phased arrays and array feeds for fixed and in-motion SatCom," Panel discussion on New Methods for Antenna Design, Satellite 2012, Washington, D.C., March 12-15, 2012.
25. K. F. Warnick, "Research frontiers in phased array antennas," International Workshop on Electromagnetic Theory, Modeling, and Simulation, June 6-8, 2011.
26. K. F. Warnick, "Phased array antennas for next-generation radio telescopes", University of Illinois at Urbana-Champaign, Nov. 16, 2010.
27. K. F. Warnick, "Phased array antennas for next-generation radio telescopes," National Astronomy Observatory of China, Beijing, Oct. 23, 2009.

28. K. F. Warnick, "Phased array antennas for next-generation radio telescopes," Tsinghua University, Beijing, China, Oct. 22, 2009.
29. K. F. Warnick, "Phased array antennas for next-generation radio telescopes," Nanjing University of Science and Technology, China, Oct. 20, 2009.
30. K. F. Warnick, B. D. Jeffs, J. Landon, J. Waldron, D. Jones, J. R. Fisher, and R. Norrod, "Phased array antenna design and characterization for next-generation radio telescopes," invited keynote talk, IEEE International Workshop on Antenna Technology, Santa Monica, CA, Mar. 2-4, 2009.
31. K. F. Warnick, "Phased array antennas for next-generation radio telescopes: design issues, characterization, and experimental results," Utah State University, Nov. 25, 2008.
32. K. F. Warnick, B. D. Jeffs, J. Landon, J. Waldron, D. Jones, A. Stemmons, "BYU/NRAO 2007 Green Bank 20 Meter Telescope focal plane array – modeling and experimental results," invited presentation, SKADS MCCT Technical Workshop on 'Design of Wideband Receiving Array Systems,' Dwingeloo, The Netherlands, Nov. 26-30, 2007.
33. K. F. Warnick, "Beam sensitivity, efficiency, and receiver noise models for focal plane arrays," invited tutorial lecture, SKADS MCCT Technical Workshop on 'Design of Wideband Receiving Array Systems,' Dwingeloo, The Netherlands, Nov. 26-30, 2007.

GRANTS

As Principal Investigator

ONR, Principal Investigator: K. F. Warnick, 1/1/2018-12/31/2020, \$691,392. "Real-time Adaptive Beamforming and Interference Mitigation," Co-Investigator: B. D. Jeffs.

Naval Air Warfare Center Weapons Division, PI: K. F. Warnick, 7/7/2017 to 6/30/2018: \$71,402. "Compact, lightweight, low cost electronically scanned phased array radar transmitter."

OverHorizon, LLC, AFRL subcontract, Principal Investigator: K. F. Warnick, 5/2016 to 12/2016: \$463,000. "Electronically Steered Array for Ku band communication On the Move Satellite Ground Terminal."

NSF, Principal Investigator: K. F. Warnick, 9/1/13-8/30/16: \$664,452. "Collaborate Research: Wide-Field L-band Focal Plane Array Beamformer for Pulsar, Diffuse Hydrogen, and Fast Transient Surveys on the GBT." Co-Investigator: B. D. Jeffs.

NSF, Principal Investigator: K. F. Warnick, 9/1/12-8/30/13: \$65,488. "2012-2013 Arecibo AO40 Cryogenic PAF Prototype Test." BYU subaward on #1207727 to Cornell University. Co-Investigator: B. D. Jeffs.

ImSAR, LLC, Principal Investigator: K. F. Warnick, 8/30/11-8/1/13: \$256,840, Air Force Phase II SBIR subcontract. "Reconfigurable RF Signature-Based GPS-Denied Navigation, Orientation Determination, and Mapping."

Linear Signal, LLC, Principal Investigator: K. F. Warnick, 1/1/12-4/30/13: \$75,000 renewal. "Low Noise Electronically Steered Phased Arrays for Satellite Communications." (Warnick is company co-founder).

Linear Signal, LLC, \$20,000 educational gift to support a Mentored Student Research Environment in Smart Antenna Systems.

Freelinc, Inc., Principal Investigator: K. F. Warnick, 4/1/11-5/31/12: \$50,000. “Broadband Near Field Wireless Link for Secure Public Safety and Tactical Military Voice and Data Communications.”

Utah Center of Excellence Grant, Principle Investigator: K. F. Warnick, 2/15/11 to 8/30/11: \$40,000. “Development of a Smart Satellite Antenna Feed.”

ImSAR, LLC, Principal Investigator: K. F. Warnick, 2/28/11-8/30/11: \$33,000, Air Force Phase I SBIR subcontract. “Reconfigurable RF Signature-Based GPS-Denied Navigation, Orientation Determination, and Mapping.”

Linear Signal, LLC, Principal Investigator: K. F. Warnick, 5/1/10-4/30/12: \$214,500. “Low Noise Electronically Steered Phased Arrays for Satellite Communications.” (Warnick is company co-founder).

Linear Signal, LLC, \$40,000 educational gift to establish a Mentored Student Research Environment in Smart Antenna Systems.

BYU Office of Research and Creative Works Mentoring Environment Grant, Principal Investigator: K. F. Warnick, 1/1/10-12/31/10: \$20,000. “Honors@ece: Taking Undergraduate Research in Electrical and Computer Engineering to the Next Level.”

National Astronomy and Ionosphere Center, Principal Investigator: K. F. Warnick, 9/24/09-10/31/09: \$5250. “Dual Dipole 800 MHz Feed for Arecibo.”

Freelinc, Inc., Principal Investigator: K. F. Warnick, 10/16/09-8/31/10: \$127,370. “Broadband Near Field Wireless Link for Secure Public Safety and Tactical Military Voice and Data Communications.”

National Astronomy and Ionosphere Center, Principal Investigator: K. F. Warnick, 9/1/09-10/31/10: \$120,750. “Focal Region Characterization, Beamforming, and Demonstrator Integration for Arecibo AO40 Phased Array Feed Feasibility Study.” Co-Investigator: B. D. Jeffs.

BYU Fulton College of Engineering and Technology, Principal Investigator: K. F. Warnick, 11/08-12/11: \$60,000. “Student Support for Development of a Multichannel Data Acquisition System for Radio Astronomy.” Co-Investigator: B. D. Jeffs.

NSF, Principal Investigator: K. F. Warnick, 9/08-9/11: \$641,275. “MRI: Development of a Flexible Multichannel Digital Receiver for Radio Astronomy.” Award #0821780. Co-Investigators: B. D. Jeffs, R. Fisher, and R. Norrod.

BYU Office of Graduate Studies: 9/06, Graduate Mentoring Award, \$5,000.

BYU Fulton College of Engineering and Technology, Principal Investigator: K. F. Warnick, 1/06-12/06: \$19,875. Research Initiation Grant, “Fresnel-zone Communications.”

Lawrence Livermore National Laboratory, Principal Investigator: K. F. Warnick, 3/01-8/02: \$33,356. “Numerical Methods for Electromagnetic Radiation and Scattering Problems.”

BYU Fulton College of Engineering and Technology, Principal Investigator: K. F. Warnick, 1/03-12/03: \$4,300. Research Initiation Grant, “Computer Simulation of Electromagnetic Radiation and Scattering.”

BYU Fulton College of Engineering and Technology, Principal Investigator: K. F. Warnick, 1/02-12/02:

\$4,300. Research Initiation Grant, “Computer Simulation of Electromagnetic Radiation and Scattering.”

As Co-Principal Investigator

NSF, Principal Investigator: B. D. Jeffs, 6/15/2018-5/31/2022, \$5,820,519. “ALPACA: Advanced Cryogenic L-band Phased Array Camera for the Arecibo Radio Telescope” Co-Investigators: K. F. Warnick, D. Campbell, and S. Parshley.

NSF, Principal Investigator: Cammy Peterson, 9/20/2017-9/19/2022, \$1,022,563. “MRI: Development of a Local Air Traffic Information System (LATIS) for UAS Collision Avoidance Research,” Co-Investigators: K. F. Warnick, R. Beard, and T. McLain.

NSF, Principal Investigator: Tim McLain, 9/1/2013-8/30/2015, \$50,000. CORBI Supplemental Request, “Compact, Lightweight, Reconfigurable Platform for Radar Signal Processing in UAS Sense and Avoid Applications,” Co-Investigators K. F. Warnick and R. Beard.

Raytheon, Inc., Principal Investigator: Brian Mazzeo, 12/6/12-8/6/2014, \$100,000. “Radome RF Property Characterization over Temperature with Non-flat Geometry.” Co-Investigator: K. F. Warnick.

NSF, Principal Investigator: Brian Jeffs, 5/23/11-5/23/14: \$305,923. “Collaborative Research: Development of a Millimeter-wave Phased Focal Plane Array.” Co-Investigator: K. F. Warnick.

Agilent Foundation, Principal Investigator: Brian Mazzeo, 1/1/11-12/31/11: \$30,000. “RF Broadband Impedance Spectroscopy for Integratable Universal Biosensing.” Co-Investigator: K. F. Warnick.

NSF, Principal Investigator: Brian D. Jeffs. 9/04 – 8/07: \$573,664. “RFI Mitigation for Radio Astronomy with Emphasis on Array Feeds.” Award #0352705. Co-Investigators: K. F. Warnick, R. Fisher, R. Bradley, and M. A. Jensen.

NSF, Principal Investigator: J. R. Fisher. 9/04 – 8/07: BYU subcontract, \$117,900. “Development of Real Time Interference Mitigation Platform.” Co-Investigators: B. D. Jeffs, K. F. Warnick, and R. Bradley

National Institutes of Health, Principle Investigator: M. L. Lee. 1/03-12/07: \$1,039,000. “Electromobility Focusing for Separation of Proteins.” Co-Investigators: P. B. Farnsworth, B. C. Stack, D. H. Tolley, K. F. Warnick, A. T. Woolley.

NASA, Principal Investigator: D. V. Arnold. 8/98-8/01: \$557,000. “Improved Estimation of Electromagnetic Bias for the JASON-1 Altimeter. Experimental and theoretical study to determine causes of the EM bias and development of improved bias correction algorithm.” Co-Investigators: W. K. Melville, M. A. Jensen, D. G. Long, K. F. Warnick. Two year renewal awarded, 9/01-9/03: \$300,000.

BYU Fulton College of Engineering and Technology, Principal Investigator: T. E. Oliphant. 1/02-12/02: \$5,000. Research Initiation Grant, “Numerical Simulation of Protein Folding in Aqueous Environment.” Co-Investigator: K. F. Warnick.

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K. F. Warnick, "Apparatus, system, and method for integrated phase shifting and amplitude control of phased array signals," U.S. patent 8,195,118, Jun. 5, 2012.

HONORS

Honorable Mention, IEEE International AP-S Symposium Student Paper Competition, Zhenchao Yang (2014)

Fellow of the Institute of Electrical and Electronics Engineers (2013)

Brigham Young University Karl G. Maeser Research and Creative Arts Award (2012)

Brigham Young University College of Engineering and Technology Excellence in Scholarship Award (2011)

Honorary Guest Professorship, Nanjing University of Science and Technology (2009)

Brigham Young University Young Scholar Award (2007)

Senior Member of the Institute of Electrical and Electronics Engineers (2005)

Outstanding Faculty Member, Department of Electrical and Computer Engineering, BYU (2005)

National Science Foundation Graduate Research Fellowship (8/94 to 8/97)

NASA Rocky Mountain Space Grant Fellowship (8/93 to 8/94)

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