Dr. Jeffrey A. Casey // Owner & Director of Research // Rockfield Research Inc.

As owner and Director of Research at Rockfield Research Inc. (incorporated in MA, 2006; re-incorporated in NV in 2012), Dr. Casey provides solutions for scientific instrumentation problems to high-tech clients. He is an experienced R&D team leader, and a proven problem solver for multi-disciplinary technical challenges. Since founding Rockfield Research, he has provided consulting services to cutting edge R&D firms in HV pulse electronics design, optics design for visible / EUV / SXR intense plasma light sources for lithography and other applications, and general experimental design and troubleshooting.

For nine years (1997-2006) he held the position of Technical Director at Diversified Technologies, Inc. (a two-time R&D 100 award winning company). As leader of R&D at Diversified, he was P.I. on a number of DoE and DoD contracts, with cross-disciplinary applications from radar to ion implantation and PEF food processing. His designs included advanced high power systems such as a 500 kV hybrid modulator to power X-band klystrons for next generation linear colliders (a 90 kV 5 kA solid state switch with a 6:1 pulse transformer), a high rep-rate 70 kV W-band gyroklystron transmitter with regenerative recovery of fCV^2 losses, and a compact 150 kW multi-phase buck converter for 48VDC telcom high-uptime point-of-use power. His contributions included design of advanced high-voltage pulsed-power solid-state systems, fast embedded control systems for high-voltage load and modulator protection, and training of new engineers in these specialized disciplines.

For three years (1992-1995) as R&D manager for the Diamond Products Division of ASTeX, Dr. Casey led a research group to develop products and processes for custom thin film CVD diamond applications. Efforts included development of a prototype 75kW microwave plasma CVD reactor which produced a world record 1g/hr of diamond. Dr. Casey was lead scientist on several contracts, including an ARPA contract to develop CVD diamond for thermal management. Other efforts included development of hi-purity ECR nitrogen sources for MBE, and optical diagnostics for semiconductor process control.

For seven years (1985-1992), Dr. Casey was a project leader and contributor to several teams at the MIT Plasma Fusion Center. During this time, he designed and constructed two large Thomson scattering laser diagnostics for the Tara Tandem Mirror and for the Alcator C-Mod tokamak plasma fusion experiments. Other work included an E||B ion spectrometer installation, divertor coil design and fabrication, a novel high power microwave antenna for overmoded megawatt mm-wave gyrotrons, and beam combining systems for hi-power microwave heating of tokamaks. He performed theoretical work in support of these and other experiments, including near field radiation patterns for overmoded mm-wave aperture antennas, novel tomographic algorithms for reconstruction of plasma density profiles from sparse array diagnostics, and edge transport on the Tara tandem mirror.

Dr. Casey's other interests include education, energy and environment, and robotics. During a two year sabbatical from high-tech (1995-1997) as VP of R&D & Engineering at Cambridge Physics Outlet, Dr. Casey managed product development for a small educational equipment manufacturing company. He was co-inventor of several novel teaching tools for middle school physics, including an intuitive sound and wave generator and a modular brushless DC electric motor kit, and contributed to curriculum development and teacher training. He has taught science, math, and computers at the Lawrence Hall of Science Museum on the UC Berkeley campus, as well as mentored Boston area students on science projects and as guest lecturer at local schools. He has taught at both the undergraduate and graduate levels at University of Colorado Boulder and at MIT. He recently

headed a “nights and weekends” team to develop an autonomous vehicle for the “DARPA Grand Challenge” race, and has developed related autonomous-intelligence projects, such as a single-chip MIDI real-time jazz improvisation circuit.

Dr. Casey received his BA in Physics from the University of California at Berkeley, and as a research assistant at Lawrence Berkeley Laboratories, he contributed to the studies of air-infiltration rates in residential structures, and means for improving energy efficiency of residential heating. He received his masters and Ph.D. in Physics from the University of Colorado at Boulder, with thesis work on experimental verification of a weak turbulence model for non-linear wave mixing of ion-acoustic waves and electron plasma waves in unmagnetized plasmas. He has published numerous technical papers, laboratory reports, and conference abstracts, and has co-authored several patents. He is a member of APS and IEEE, and a US Citizen.

Selected Publications

G. Wallace, *et al*. **Advances in Lower Hybrid Current Drive Technology on Alcator C-Mod.** 2013 Nucl. Fusion **53** (2012)

J.A. Casey, F.O. Arntz, M.P.J. Gaudreau, and M.A. Kempkes. **Solid-State Marx Bank for the Next Linear Collider.** 26th Int’l Power Modulator Symposium, p257 (2004)

J.A. Casey, R.P. Torti, N. Reinhardt, F.O. Arntz, M.P.J. Gaudreau, M.A. Kempkes. **A 500 kV power system for a gridded sheet-beam klystron.** 26th Int’l Power Modulator Symposium, p266 (2004)

J.A. Casey, F.O. Arntz, M.P.J. Gaudreau, M. Kempkes, J.P. Eichner, S.J. Gold, R.F. Koontz. **Solid-State Hybrid Modulator for the Next Linear Collider.** 14th IEEE Int’l Pulsed Power Conf., **1,** 543 (2003).

M.P.J. Gaudreau, J.A. Casey, M.A. Kempkes, T.J. Hawkey, and J.M. Mulvaney. **Solid-State Modulators for Plasma Immersion Ion Implantation Applications.** J. Vacuum Science & Technology B: Microelectronics and Nanometer Structures **17,** 888 (1999)

R.L. Ives, A. Singh, M. Mizuhara, R. Schumacher, J. Neilson, M. Gaudreau, J.A. Casey, V.L. Granatstein. **Design of a multistage depressed collector system for 1 MW CW gyrotrons. II. System consideration.** IEEE Transactions on Plasma Science **27**, 503 (1999)

J.A. Casey, R. Watterson, F. Tambini, E. Rollins, and B. Chin. **Construction of a scanning two-dimensional Thomson scattering system for Alcator C-Mod.** Rev. Sci. Instrum. **63,** 4950 (1992).

M. Blank, J.A. Casey, K.E. Kreischer, R.J. Temkin, and T. Price. **Experimental study of a high efficiency quasi-optical mode converter for whispering gallery mode gyrotrons.** Int. J. Electronics **72,** 1093 (1992).

J.A. Casey, E. Sevillano, J.H. Irby, and B.G. Lane. **A Pseudo-Tomographic Fitting Algorithm for Density Profile Reconstruction from a Sparse 1-D Interferometer Array.** Rev. Sci. Instrum. **59,** 1067 (1988).

J.A. Casey, B.G. Lane, J.H. Irby, K.L. Brau, S.N. Golovato, R.S. Post, and E. Sevillano. **Experimental Studies of Divertor Stabilization in an Axisymmetric Mirror.** Phys. Fluids **31,** 2009 (1988).

J.A. Casey and J.H. Irby. **Thomson Scattering in the Tara Tandem Mirror Central Cell.** Rev. Sci. Instrum. **57,** 1804 (1986).