Dr. Craig Edmond Deibele

PhD | PE | MBA

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Professional Experience

Spallation Neutron Source – Oak Ridge National Laboratory, Oak Ridge, TN

Senior RF and Microwave Engineer, May 2019 – Present

Lead engineer for the design of a beam power monitor and safety system for the Proton Power Upgrade Project. This system is a credited engineering control design that limits the power delivered to the target systems. The design integrates fast current transformers, field programmable gate arrays in compliance with DO-254 for accreditation, PLCs that integrate into the accredited safety system, and machine protection systems. I am writing the requirements for the system, requirements for the beam current transformer, and front-end electronics. I liaise with the digital engineers, PLC engineers, and mechanical engineers.

"SNS Credited Pulse Energy Limit System Conceptual Design", Proceedings of ICALEPCS 2019

US ITER – Oak Ridge National Laboratory, Oak Ridge, TN

Systems Engineer, ICH Transmission Line Manager, Senior Microwave Analyst, 2014 – May 2019

Moved through progressive roles beginning tenure as Senior Systems Engineer, then moved into a Management role and lead the Ion Cyclotron Heating Transmission Line system. I completed my tenure and served as a Senior RF Analyst for the Electron Cyclotron Heating Transmission Line System. Integral member of the senior management team, constructing growth plans and establishing goals and corporate priorities. Track and analyze key metrics to identify areas of critical opportunity and potential cost savings, partnering with the operations team to eliminate or reduce losses through root cause analysis. Manage risk to drive corporate objectives in the areas of environment, health and safety, asset capability, quality, and production.

- Mentor and lead a team of project engineers, process engineers, planners, technicians, and engineering interns concerning project management, process improvements, training, and career development.
- Define the cost and schedule for Ion Cyclotron Heating (ICH) Transmission Line / Matching System (ICH TL/MS) for baseline implementation in P6 and compliance with 413.3B.
- Orchestrate activities within the ICH TL/MS system, US ITER organization, and the International Organization in France; promote cross-team collaboration to drive performance results.
- Partner with international engineering teams in a collaborative effort to design and build high power long pulse RF hardware; build a team of specialists in RF/electrodynamics, civil construction, nuclear operations, quality control, and mechanical design engineering.
- Draft specifications for high power RF hardware designs and interface with external vendors and scientists to optimize performance within cost and schedule envelope.
- Accountable for scheduling and technical aspects of designs that spanned several engineering domains; facilitated final design review for components for qualification testing of 3 MWatt RF transmitters.
- Performed electrodynamic and RF calculations on the 35-65 MHz transmission lines that showed that the transmission lines meet system requirements and can guide up to 12 MWatt of CW power.
- Performed electrodynamic calculations on the 170 GHz quasi-optical over-moded transmission lines for the Electron Cyclotron Heating System and showed that various components meet system requirements. In particular, I studied the vacuum pumpout ports for the ECH transmission lines and designed the pumpout body ensuring that sufficient margin for damage from melting is not possible.

The US ITER project is export controlled, and public dissemination of documentation is not possible. An example of some documentation follows:

"Calculation for Power Balance in ECH Vacuum Pumpout"
"Calculation for ICH Outer Conductor Ovality Tolerance"
"Calculation of Matched ICH Transmission Lines in the RF Building for RF Source Testing"
"Calculation of ICH Transmission Line Heat Loads in Building 15"

Continued…

Craig Edmond Deibele

Oakridge National Laboratory, Oak Ridge, TN

Senior Scientist, 2001 – 2014

Created value for clients, leading a team of graduate students (6 MS and 2 PhD) and 2 post-doctoral fellows in the fields of electrical engineering and physics. Conducted extensive research and analysis to plan, organize, and technically direct all stages of projects. Promoted the integration of people, processes, and systems to manage and reduce costs, simultaneously performing in multiple capacities; coordinated communications between multiple departments to execute strategies.

- Tuned the SNS Copper Linac Cavities by a series of electromagnetic bead-pull perturbation measurements and administered permanent mechanical modifications and deformations in the beamline hardware.
  "DTL Cavity Tuning at SNS", SNS-NOTE_ENGR_74
  "r_s/Q measurements for the DTL Tanks", SNS-NOTE_ENGR_89
  "Random Errors in Measurement of the Field Stabilization for Tank#1 Cold Model", SNS-NOTE_ENGR_90
  "Low Power RF tuning of the Spallation Neutron Source Warm Linac Structures," C. Deibele, et. al. Proceedings of the Linac conference 2004
- Lead System Engineer for the Beam Position Monitor System; generated a new electromagnetic design of beamline hardware operating between 402.5 and 805 MHz, designed and implemented a robust design of a stable site-wide clock distribution system, performed a series of measurements to de-embed the sitewide timing system, analyzed the RF master oscillator.
  "Source Jitter and Phase Noise Analysis", SNS-NOTE-DIAG-104
  "Timing System Delay Measurement for the SNS BPM System", SNS-NOTE-ENGR_0163
  "Simulation of 12 cm BPM Electrodes for the SNS HEBT BPM System", SNS-NOTE-AP-0148
  "Matching the Electrodes of a Two Conductor BPM to a Circuit", SNS-NOTE-DIAG-0079
  "Electrode Design for the Coupled Cavity Linac Beam Position Monitor", SNS-NOTE-DIAG-0042
  "Electrode Design for the Superconducting Linac Beam Position Monitor", SNS-NOTE-DIAG-0047
  "Synthesis and Considerations for Optimally Matching to a Beam Position Monitor Circuit Impedance", SNS-NOTE-DIAG-0031
  "Drift Tube Linac Beam Position Monitor Calculations and Comparisons", SNS-NOTE-DIAG-0010
  "Matching BPM Stripline Electrodes to Cables and Electronics," C. Deibele, et al. Proceedings of the 2005 Particle Accelerator Conference
  "Design and Status of the BPM RF Reference Distribution in the SNS", Proceedings of the 2005 Particle Accelerator Conference.
- Created the electrodynamic RF design of an electron collector system for the laser wire profile monitor system; featured a novel transmission line resonant filter embedded inside of the vacuum system on the collector itself to remove parasitic electromagnetic effects caused by passing charged particles.
- Lead the design of an ionization profile monitor in the SNS Ring. This involved overseeing the work of a graduate student in physics as the doctoral thesis work was ongoing.
  "Design of an Ionization Profile Monitor for the SNS Accumulator Ring." Nuclear Instruments and Methods in Physics Research A, September 29th, 2014
- Designed and patented a microwave DC-40 GHz bandwidth Fast Faraday Cup to cheaply and directly measure picosecond-level timing resolution of charged particle beams.
  C. Deibele. Fast Faraday Cup with High Bandwidth. US 7,012,419 B2, March 16th, 2006.
  "Proposal for the Design of the Fast Faraday Cup to Measure the Longitudinal Profile of the 2.5 MeV Beam after the RFQ at the SNS", SNS-NOTE-ENGR-0004.pdf
- Developed an analog and mixed-signal feedback-damper system to stabilize proton beams; system has a 1-300 MHz bandwidth, requires picosecond timing constraints and up to 400 Watts per channel with sub-5 degree system dispersion.
  "Design and Construction of a 300 MHz Low Pass Filter with a 402.5 MHz Notch", SNS-NOTE-lpf

"Design and Construction of an Equalizer for the Ring Feedback System", SNS-NOTE-feedback-equalizer
"De-embedding a Cable Using FIR Signal Processing Techniques", SNS-NOTE-0171
"Project Report for Work Done on a Mixed Signal Feedback Damper System", SNS-Note-0175
"Experimental Tests of a Prototype System for Active Damping of the E-P instability at the LANL PSR," C. Deibele, et al. Invited talk proceedings of the Particle Accelerator Conference 2007
"Transverse Beam Stability Measurement and Analysis for the SNS Accumulator Ring," Z. Xie, et al. Nuclear Instruments and Methods in Physics Research Section A, March 12th, 2015.

- Principal Investigator of the design and patent of circuitry that accurately and safely measures ~10 nanosecond risetime/falltime, 3 kV pulses; contributed to the redesign of the high-power pulse network distribution. This design is used to monitor the MEBT chopper pulser to guarantee that it is working properly.
  "Theory, Design, and Implementation of a Broadband High Impedance Pickoff Circuit for the MEBT Chopper Pulser System", SNS-NOTE-0182
  C. Deibele, et al. Broadband High Impedance Pickoff Circuit. US 8,063,649 November 22nd, 2011
- Principle Investigator for the designed and patent of a novel electromagnetic vacuum detector and RF electronic circuitry for the measurement of a high dynamic range (120 dB) high speed (5 nanosecond risetime) current measurement system.
  C. Deibele, et al. High speed high dynamic range high accuracy measurement system. US 9,506,953 B2. November 2016
  "High Dynamic Range High Speed Linac Current Measurements," C. Deibele, et al. Proceedings of the 2012 Linac Conference
- Designed and implemented a system to protect the ring from beam spill into the gap caused by the LEBT Chopper deflector failure. This system is required for SNS to conduct operations into the ring and target. This measurement relies heavily on a calibration of logarithmic amplifiers and the logarithmic amplifiers are used in other embodiments of my work.
  "Log Amp Calibration Setup and Procedure", SNS-NOTE-DIAG-0177
  "High Dynamic Range Current Measurements with Machine Protection", D. Thompson et. al, Proceedings of ICALEPS 2007
  "High-dynamic Range Current Measurements in the Medium-Energy Beta Transport Line at the Spallation Neutron Source", D. Bartkoski et.al, Proceedings of LINAC 2006

Fermi National Accelerator Laboratory –Batavia, IL

Microwave Engineer, May 1998 – May 2001

I had multiple responsibilities while working at Fermilab, from working with the Anti-proton source and designing components from the stochastic cooling system to designing parts for future RF cavity systems. The bulk of my time was working with the stochastic cooling system, and I helped increase the stacking rate of antiprotons from 6 mA/hour to 10 mA/hour to support the Run 2 cycle of the Tevatron. The stochastic cooling system had transverse and longitudinal systems and each system was divided into frequency bands. I was responsible for designing short time delay band pass filters between 500 MHz and 8.5 GHz, equalizers, and co-planar waveguide antennas to pickup and/or kick the beam.

"Simulation and Measurement Considerations for Resonant Cavity Couplers and Extrapolating Results to Multiple Cells and Varying Conductivities.", RFI Note 005
"Simulation of Two Rival Input Coupler Designs for the Superconducting Kaon Separator Cavity.", RFI Note 011
"Design of an 805 MHz BPF for the High Energy Section of the Linac at FNAL", RFI Note 005
"Design and Implementation of the Debuncher Bands 3 and 4 System Filters.", RFI Note 007
"Design and Measurement Procedure for Assembling SMA - 96 mil 2.33 Dielectric Constant", RFI Note 013
"Debuncher Band 4-Upper Design Modification", RFI Note 018
"Design of Microwave Band Pass Filters for the Debuncher Stochastic Cooling System", Pbar Note 650
"Synthesis of Band Pass Filters and Equalizers using Microwave FIR Techniques", Pbar Note 643
"Design of the 2-4 GHz Betatron Equalizer", RFI Note 001
"Design of the 0.5 - 1 GHz Recycler Pickup and Kicker Antennas", Pbar Note 627
"Design of 2-4 GHz Equalizers for the Antiproton Accumulator Stacktail System", Pbar Note 622
"Calculation of the Reflection Coefficient and Transmission Coefficient for Gradual Waveguide Structures", Pbar Note 612

Deutsches Elektronen Synchrotron –Hamburg, Germany

Post Doc, November 1996 – April 1998

Craig Edmond Deibele

During my time at DESY, my responsibilities were to analyze multiple cell superconducting cavities and determine a method for finding the electrical axis of the cavity. The goal behind this effort is to determine where the electrical axis of a cavity is and determine if the electrical axis is offset from the mechanical center of the cavity. I also spent time looking at ferrites and determine the performance of the ferrite losses when it is reduced to a temperature at liquid nitrogen. I also spent time supporting the team that made measurements on production cavities for the TESLA collaboration (i.e. Q versus T, Q versus E, and documenting the performance limitations).

"Transmission Line Measurement of the Microwave Losses in Ferrites at Low Temperatures", DESY Note

"Experimental Determination of the Electrical Axis in Cavities", DESY Note

Argonne National Laboratory – Argonne, IL

Laboratory Graduate Assistant, January 1993 – November 1996

During my time at Argonne, I focused my research on the study of stretched wire measurements and the application of a stretched wire measurement to accelerator structures. I did a theoretical analysis of how an ultra-relativistic charged particle beam interacts with a cylindrically symmetric structure, and compared my analysis to a measurement performed at the Argonne Wakefield Facility. I then did a similar analysis of a stretched wire measurement to a microwave structure. This work supported my PhD thesis work at the University of Wisconsin Madison.

"Analysis of Ultra-relativistic Charged Particle Beam and Stretched Wire Measurement Interactions with Cylindrically Symmetric Structures (PhD Dissertation)", Light Source Note 261

Education

Master of Business Administration | University of Tennessee – Knoxville December 2002
GPA 3.47 / 4.000

PhD in Electrical Engineering | University of Wisconsin – Madison, December 1996
Graduated with minor in mathematics and in physics GPA 4.000/4.000

Master of Science in Electrical Engineering | University of Wisconsin – Madison December 1993
GPA 3.667 / 4.000

Bachelor of Science in Electrical Engineering | University of Wisconsin – Madison December 1990
Graduated with Honors and Distinction; Double major in mathematics GPA 3.732 / 4.000

Professional Honors / Technical Societies
Professional Engineering License in Wisconsin (License 33256-6, Issued Feb 1999), Illinois (License 062054241, Issued Sep 2000), and Tennessee (License 107227, Issued Dec 2001).
Professional Electrical Engineering License Committee, National Council of Engineering Examiners, 2006-present
IEEE Senior Member. Held offices of Chair, Vice-Chair, and Secretary for East Tennessee Section.
IEEE editorial board for Microwave Theory and Techniques Society and Journal.
APS editorial board for Division of Physics of Beams
Sigma Xi - honorary research society.
United States Patent 9,506,953 B2, United States Patent 8,063,649 and United States Patent 7,012,419.