**Carl Dukes  
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**DOE Q Clearance**

**Professional Summary**

Highly skilled Senior Instrumentation and Controls Engineer with extensive experience in research and development at Oak Ridge National Laboratory (ORNL). Proven expertise in designing, implementing, and optimizing advanced control systems for cutting-edge research projects. Adept at collaborating with multidisciplinary teams to deliver innovative solutions that drive scientific discovery and technological advancement. Demonstrates exceptional leadership, problem-solving, and communication skills within high-stakes environments.

Consulted for agencies on National Security matters, providing expertise across multiple disciplines including electrical, mechanical, and nuclear designs, programming, training, human subject testing, biometrics, deception detection technologies, and cybersecurity. Capable of implementing expertise, team members, and available resources to maximize the effectiveness and success of projects.

**Professional Experience**

**Oak Ridge National Laboratory 1995 – Present**

Electrification and Energy Infrastructures Division, RF & Intelligent Systems Group,

October 2017 – Present.

Matrixed to Cyber Resilience and Intelligence Division, Embedded Systems Security Group.

2022 – Present

Electrical and Electronics Systems Research Division, Sensors and Controls Research (SCR) Group, 2005 – October 2017

Holifield Radioactive Ion Beam Facility, Physics Division 1995 - 2005

* Senior I&C Engineer
  + Managed team of engineers and designers across multiple disciplines in the development of a power distribution network.  Designed and supported the water-cooling systems for fusion division for multiple projects including the Instrumentation and Controls integration equipment.  Hand-picked multiple components based on power-design-analysis including power supplies, load banks, and controls for designing a research power distribution facility.  Created and back-checked mine and other engineer’s P&IDs for a variety of projects. Co-designed, fabricated, and employed a programmable I&C system for operating and collecting data for testing of ECH components overseas. Co-created a complete operations and diagnostics manual for our in-house I&C ECH data collection and monitoring system which included hardware and software descriptions, I/O lists, state transition diagrams and descriptions, flowcharts and troubleshooting sections. Designed and or codesigned panel layouts within solid works including cooling load calculations/analysis for specialized equipment.
  + Conducted several EEI (Electrical Equipment Inspector) inspections for ORNL across multiple divisions and classifications.
* Senior R&D Engineer
  + Performed engineering design and development as a team lead for multiple projects involving biometric image R&D applications including system optics, hardware design, 3D cameras as well as software development in image analysis by applying image processing methods and deep learning models to video data. Participated in multiple large scale field video data collections involving both COTS and customized surveillance and specialized cameras.
  + Consulted in-house and in the field for agencies concerning Deception Detection Systems/Technology and their associated protocols.
  + Lead programmer for the Avatar Deception Detection System.
  + Conducted and/or consulted for multiple successful Human Subject Testing campaigns over the course of my 30-year career at ORNL.
  + Successfully led teams and consulted several US ITER Electron Cyclotron Heating and Current Drive (ECH-CD) international testing campaigns in Switzerland and Japan over multiple years.
  + Negotiated schedules with multiple international governments for the US ITER ECH testing campaigns.
  + Conceived, designed, built, packaged, and deployed sensors and control systems to solve challenges of national importance.
* Physics Division Operator & Lead Technician
  + Certified operator for the Tandem Electrostatic Accelerator, Oak Ridge Isochronous Cyclotron (ORIC) and Radioactive Ion Beam (RIB) Target Ion Source.
  + Lead technician and responsible for the operation and maintenance of the facility accelerators, ion sources, beam transport, vacuum systems, support systems and Bldg. 6000 utility systems.
    - Responsible for designing the expanded RIB platform cooling water system using fluid dynamics and heat transfer fluid flow to properly size pumps, heat exchangers, and piping layout.
    - Coordinate and supervise work done by craft personnel.
    - Lead vacuum technician responsible for leak testing and certifying vacuum systems.
    - Experienced in operation, maintenance, and analysis of residual gas analyzers and mass spectrometry.
    - Aligned and/or assisted in the alignment of Beam Profile Monitors, beam lines, targets, optics and more.
    - Assist engineering staff on special projects and designs.
    - Developed operator requirements and implemented software graphical user interface utilizing Epics Device Manager.
    - Developed technical procedures and logs for various systems and components.

**Alcatel Fiber Plant North America, Claremont, North Carolina, 1993 – 1995**

**Technical Trade Skill Associate for Measurements (Quality Control) and Environmental Laboratory.**

* Lead Technician responsible for fiber optic manufacturing plant where I maintained and programmed PLCs, sensitive electrical and mechanical equipment, performed complex optical and mechanical alignments, developed Quality Control and maintenance procedures, and trained technicians.
* Notable achievement: Resolved modular noise issues on Optical Time Domain Reflectometers, which significantly contributed to longer fiber runs and tighter controls within the QA program.

**United States Navy,** 1988 - 1993

**Primary Duty: Nuclear Engine Room Supervisor**, served on board three Nuclear Submarines: **USS M. G. VALLEJO (SSBN-658)**, **USS GEORGE BANCROFT (SSBN-643)**,and **USS HENRY L. STIMSON (SSBN-655)**.

* Supervised mechanical plant operations and maintenance within engineering spaces.
* Coordinated all mechanical watch stations while underway.
* Served as Ship’s Quality Assurance/Control Supervisor, Audit/Surveillance Coordinator and Calibrations Coordinator on Multiple deployments.

**Technical Skills**

* SME in Deception Detection Systems and Protocols
* Biometrics SME
* Human Subject Testing SME
* Expertise in instrumentation and controls design and integration
* Proficient in multiple programming languages including Python and LabView
* Advanced knowledge of PLCs, SCADA systems, and DCS platforms
* Experience with sensor technologies, data acquisition systems, and calibration methodologies
* Familiarity with cybersecurity protocols and compliance standards (e.g., NIST, DOE)
* Strong analytical and problem-solving skills with a focus on R&D applications
* Adept in developing mechanical designs and implementations
* Skilled in 3D modeling software such as Solid Works
* Thinking outside the box to solve issues

**Education**

**Lewis University, Romeoville, Illinois 2012-2015**

**M.S. in Information Security, 4.0 GPA**

* Thesis: *USB Rubber Ducky Concept and Demonstration*
* Course work included: Intrusion Detection Response and Recovery, Operating Systems, Data Networking, Encryption and Authentication Systems, Legal and Ethical Issues, Computer Forensics, Information Security Strategies, Risk Management, Wireless Security, LINUX, Software Vulnerability and Defense, and Database Management and Security.

**University of Phoenix, Phoenix, Arizona 2007-2010**

**B.S. in Information Technology/Software Engineering, Graduated with honors, 4.0 GPA**

* Course work included: Project Planning and Implementation, Networking, Telecommunications, Operating Systems, Database, Information Processing, WEB Design, and Programming Concepts.
* Programming Languages: C, C#, C++, SQL, Java, JavaScript, Visual Basic, and WEB Design (XML, HTML, XHTML, and CSS)

**Harold Washington College**, Chicago, Illinois **1991-1994**

**A.S. in Science, Graduated with High Honors, 3.81 GPA**

**UNITED STATES NAVY 1988-1993**

Nuclear Field "A" School (Mechanical Principles)

Nuclear Power School, Nuclear Power Prototype School

Completed approximately 3600 hours of additional technical training with multiple certifications

**Certifications and Training**

* ORNL Electrical Equipment Inspector (EEI) Certification (January 2025)
* ORNL Hoisting and Rigging Competent Person Certification/Role (July 2017)
* Attended Chattanooga EPB training (July 2024)
* 2-Yr Electricity & Electronics Vocational School Certification (1986-1987)

**Publications and Presentations**

* Hanson, G., Wolfe, Z., Kaufman, M., Hale, Z., Dukes, C., Shanmugasundaram, A., Casal, N., Gandini, F., Goodman, T., Henderson, M., Schaich, C., & Takahashi, K., Publication ID: ORNL-210930, “ITER ECH transmission line system design and status”: EPJ Web of Conferences, 313, 4004, November 2024
* Karnowski, T., Aykac, D., Torkelson, L., Potok, T., Haas, N., Sobel, P., Dukes, C., Thompson, L., Murphy, B., Sreehari, S., & Sullivan, H., Publication ID: ORNL-226032, “MSALTS FY24” September 2024
* Brogan, J., Cornett, D., Barber, N., Aykac, D., Burchfield, N., Dukes, C., Duncan, A., Ferrell, R., Goddard, J., Baird, S., Jager, G., Larson, M., Murphy, B., Johnson, C., Shelley, I., Srinivas, N., Stockwell, B., Thompson, L., Yohe, M., Zhang, B., Dolvin, S., Santos-Villalobos, H., & Bolme, D., Publication ID: ORNL-186854, (2023, January). “Expanding accurate person recognition to new altitudes and ranges: The BRIAR dataset”, In 2023 IEEE/CVF Winter Conference on Applications of Computer Vision Workshops (WACVW) (Issue 1, pp. 593–602).
* Matthew D. Larson, Andrew M. Duncan, Brandon Stockwell, Carl Lee Dukes, “Locations Survey Report: Biometric Recognition and Identification at Altitude and Range (BRIAR): Testing and Evaluation Support”; Report No. ORNL/SPR-2020/1870 April 2021
* V.F. Shevchenko, Y.F. Baranov, T. Bigelow, J.B. Caughman, S. Diem, C. Dukes, P. Finburg, J. Hawes, C. Gurl, J. Griffiths, J. Mailloux, M. Peng, A.N. Saveliev, Y. Takase, H. Tanaka, G. Taylor, “[Long pulse EBW start-up experiments in MAST](https://www.epj-conferences.org/articles/epjconf/abs/2015/06/epjconf_ec2015_02007/epjconf_ec2015_02007.html)”: EDP Sciences, EPJ Web of Conferences, Volume 87, 2015
* Tim Bigelow, John Caughman, Ian Campbell, Stephanie Diem, Carl Dukes, Richard Goulding, Stephen Killough, Juergen Rapp, “A 28 GHz ECH/EBW System for the Proto-MPEX plasma source”: APS Meeting Abstracts, November 2015
* Bigelow T.S., Barker A.M., Dukes C.L., Killough S.M., Kaufman M.C., White J.A., Bell G.L., Hanson G.R., Harvey J.A., Rasmussen D.A., Publication ID: ORNL-50531, “Initial Results for a 170 GHz high power ITER waveguide component test stand”: American Physical Society, 56th Annual Meeting of the APS Division of Plasma Physics, Oct 27-31, 2014
* Hanson, G.R., Bell G.L., Bigelow T.S., Coffey E.N., Dukes C.L., Griffith I.L., Kaufman M.C., Lumsdaine A., Luttrell C.R., McElhaney K.L., Melin A.M., Peters R.B., Rasmussen D.A., Sanabria R.M., Schaich C.R., Wolframe W.J., Shapiro M., Temkin R.J., Publication ID: ORNL-50623, “Design Analysis of the ITER ECH Transmission Line System and Components”: RF Heating Technology of Fusion Plasmas 2014, September 22-24, 2014
* Bigelow T.S., Kaufman J.B., Dukes C.L., Goulding R.H., Rapp J., Diem S.J., Biewer T.M., Publication ID: ORNL-50012, “A 28 GHz 200 kW generation and launching system for ECH/EBW on Proto-MPEX at ORNL”: 2014 IEEE International Conference on Plasma Science, Washington, DC, May 27-30, 2014
* Tim Bigelow, Greg Hanson, Dave Rasmussen, Alan Barker, Carl Dukes, Stephen Killough, Brian Peters, Robin Rumbolt, Chuck Schaich, Roberto Sanabria, Karen McElehaney, John White, Stephen Allison, “Progress on an ITER ECH Transmission system development and testing”: APS Meeting Abstracts, October, 2012
* Wood N.L., Dukes C.L., Chiaro Jr. P.J., Publication ID: ORNL-6481 “Characterization of a Subway Environment”: Report No. ORNL/TM-2007/071 July 2007

* [D.K. Olsen,](http://www.sciencedirect.com/science/article/pii/S0168900296003981" \l "!) [R.L. Auble](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [G.D. Alton](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [J.D. Bailey](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [M.R. Dinehart](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [C.L. Dukes](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [D.T. Dowling](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [D.L. Haynes](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [C.M. Jones](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [S.N. Lane](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [C.T. LeCroy](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [R.C. Juras](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [M.J. Meigs](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [G.D. Mills](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [S.W. Mosko](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [P.E. Mueller](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [S.N. Murray](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [B.A. Tatum](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [R.F. Welton](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), [H. Wollnik](http://www.sciencedirect.com/science/article/pii/S0168900296003981#!), “Progress, status, and plans for the HRIBF project”: [Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment](http://www.sciencedirect.com/science/journal/01689002), Volume 382, Issues 1-2, November 11, 1996

**US ITER iDOCS Reports**

* Greg Hanson and Carl Dukes; iDOCS UID: US-D\_23YCHJ, “Report of ECH Transmission Line Proof-of-Concept Component Testing Phase 3”, February 29, 2020
* Kathy Hylton and Carl Dukes; iDOCS UID: US\_D\_22FLPH, “Report of ECH Transmission Line Proof-of-Concept Component Testing Phase 2 for Period of August -October 2016”, April 02, 2018
* Kathy Hylton and Carl Dukes; iDOCS UID: US\_D\_22T2WX, “Report of ECH Transmission Line Proof-of-Concept Component Testing Phase 1 (May-July 2016)”, January 12, 2017
* Kaufman M.C. and Dukes C.L.; iDOCS UID: US\_D\_232NKM, “Tube and Waveguide Straightness Measurements”, November 06, 2014

**Professional Affiliations**

* Member, Institute of Electrical and Electronics Engineers (IEEE)

**Awards and Recognitions**

* ORNL’s “The answer could be yes” Article on Carl Dukes September 18, 2023
* ORNL SEA & SPA Awards for multiple projects
* ORNL Project Team Awards
* FY 22 NSSD Awards for RESEARCH ACCOMPLISHMENT for work using a complex suite of ground and aerial sensors to collect the nation's largest long-range biometric dataset for gait and facial imagery--elevating ORNL as the epicenter for human identification R&D.

**Hobbies and Interests**

* Interest in mentoring and counseling others
* Bushcraft, outdoors, hiking, hunting and fishing, and gardening
* Collaborating and leading book studies
* Boy Scouts of America
* Music such as guitar, electric bass, and mandolin
* Metal working, 3D printing, and programming
* Elected Councilmember to a charitable organization to better our local and global communities