

SUMMARY

Engineering physicist seeking technical role in research and development. Skills include

- Hardware Prototyping, Testing; Experimental Design, Execution, Systems Integration
- Scientific Computing, Modeling, Algorithms; Data Analysis, Report Writing

Particularly skilled at multidisciplinary problems. Domain expertise in

- Medical imaging (MRI, CT), medical devices, physics
- Free-space optics, electronics (embedded, RF), X-ray systems (generation, detection, simulation)

EDUCATION

**University of Toronto**, Canada

PhD, Physics, Experimental Quantum Optics, 2011

MSc, Physics, Experimental Quantum Optics, 2002

**Queen's University**, Canada

BSc, Engineering Physics, 2001

**Universität Stuttgart**, Germany

Exchange Year, Physics, Engineering, Languages, 2000

WORK EXPERIENCE **C. W. Ellenor Consulting Inc.**, Toronto, ON, October 2016-present *Principal*

**X-Ray Source Development**

- Conceptualization, design of innovative radiotherapy source using GEANT4 physics modeling
- Design and execution of lab protocol for prototype verification, report to support FDA filing
- Achieved 1% agreement of laboratory dosimetric measurements and a priori physics simulations

**Tomosynthesis System Concept Development**

- Evaluation of proposed tomosynthesis system for new potential market
- Simulation of data acquisition and image reconstruction for feasibility of proposed system
- Providing technical guidance on prototype system design

**Triple Ring Technologies**, Newark, CA, March 2014-September 2016 *Senior Physicist*

**CT Product Development** for medical application. Responsibilities: detector evaluation, including test stand, protocol development, data analysis, report writing; Experimental data production and analysis, reconstruction code base; Documentation review; Software test design and execution.

**X-Ray Source Development** for security application. Algorithm design for electron spot measurement, alignment algorithm for scanning beam source. Systems integration and troubleshooting during prototype bringup.

**X-Ray Fluoroscopy** NIH-funded research on prototype X-ray imaging system. Responsibilities: Project management, quantified aspects of imaging performance, supported code development, image analysis.

**Tabletop CT** Design and construction of experimental tabletop CT system for various applications. Included systems integration, construction of custom parts, software design.

**Procyon Engineering**, San Jose, CA, 2013-present *Consultant*

Developed GUI in Python to interact with embedded ARM processor in scientific instrument

Modified firmware on a commercial device to support development of custom software application

POSTDOCTORAL RESEARCH EXPERIENCE	<p><b>Stanford University EE</b>, 2012-2014 <i>Postdoctoral Fellow / Physicist, MRI systems technology</i></p> <p>Postdoctoral research developing RF measurement techniques and devices in an MRI technology lab</p> <p>Detection of dangerous RF coupling to implants / interventional devices via imaging coil impedance</p> <p>Development of embedded systems for wireless coils, motion sensing and RF current detection</p> <p><b>Wireless Sensor Modules</b> Conceptualized and developed wireless devices for measurement of wire current and of patient motion and heartbeat in an electromagnetically hostile MRI environment. Based on Atmel ATmega128RFA1, EE 802.15.4, SPI, I2C. Incl. PCB and mechanical design.</p> <p><b>Implant Detection</b> Developed a technique for physical detection and mitigation of risk for patients with implants or interventional devices, based on low-power coil impedance measurements using directional couplers, and phased array reconfiguration. Employed custom, wireless current sensors.</p> <p><b>Rung Current Sensors</b> Optical current sensors for realtime visualization of currents in coil elements, custom RF PCB, AVR microcontroller based, multiplexed measurement.</p> <p><b>Wireless MRI Coils</b> Custom PCB for high speed digitization (80MSPS), FPGA based DSP, TCP/IP distribution via ARM PRU unit, custom Python GUI, inductive (wireless) sample clock synchronization.</p>
PHD RESEARCH EXPERIENCE	<p>Developed complex, multidisciplinary tabletop experiment to study quantum states of ultracold atoms.</p> <p><b>Optical Barrier Beam</b> Designed optical system to produce “sheet of light” time-averaged optical potential. New hardware (optical setup, FPGA) and software (Verilog, LabView) were developed, as well as a genetic algorithm, CCD feedback and experimental verification protocols.</p> <p><b>Diode laser system</b> Designed 12-beam array of free-space beams, appx. 1W total power, sub-MHz frequency stabilization using current and temperature control. Employed saturated absorption spectroscopy, injection locking, beam-shaping optics, polarization optics, acousto-optics, tapered amplifiers and optical fiber. Beams are switchable with appx. 5% power stability.</p> <p><b>Vacuum technology</b> Constructed, baked, maintained dual-chamber system, pressures of <math>10^{-11}</math> Torr (UHV). Familiar with design concepts, mechanical, turbo, ion, Ti-sub pumps.</p> <p><b>Other laser systems</b> Measurement using photodiodes, wavemeters, Fabry-Perot cavities, shear plate interferometers, beam profilers, CCD imaging. Some experience with argon ion, helium-neon lasers, pulsed fiber lasers</p> <p><b>Magnetic Field Driver</b> Supplied 20A at 10kHz to inductive load (coils) with feedback stabilization of amplitude. USB programmable, triggering and shutoff from external pulses.</p>
SOFTWARE	<p><b>Scientific Computing</b> MATLAB, Python (SciPy, NumPy), QT, LabVIEW</p> <p><b>Embedded C</b> (AVR microcontrollers, Arduino), Verilog (Altera FPGA)</p>
TEACHING	<p><b>University of Toronto</b>, 2003-2010 <i>Teaching Assistant</i></p> <p>Advanced Laboratory Demonstrator (3 years)</p> <p>Mentored senior students through advanced physics experiments</p> <p>Responsible for grading, office hours</p> <p>Experiments in Quantum Optics, Condensed Matter and High Energy Physics</p> <p>Tutorial Leader (3 years)</p> <p>Led tutorial sections with 30+ freshman students</p> <p>Responsible for grading, office hours</p> <p><b>EOS Kids, South Korea</b>, 2002-2003 <i>English Teacher</i></p> <p>Class sizes of 12, students aged 6-14</p>
PROTOTYPING	<p>PCB Design/Assembly/Rework, Arduino, Embedded Linux systems, Scripting, Metalworking, Woodworking, SolidWorks, CAD, Laser Cutter</p>
LANGUAGES	<p>Conversational in German, intermediate in French and Russian, some knowledge of Korean, Hindi/Urdu.</p>