

# VitaTech Engineering, LLC

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EMF Measurements, Surveys & Risk Assessment  
EMF Mitigation - Shielding & Cancellation  
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## University & NanoTechnology Clientele

UCLA, Los Angeles, CA – California NanoSystems Institute (CNIS)  
Georgia Institute of Technology, GA – NanoTechnology Research Center Building  
Duke University, Durham, NC – CIEMAS & French Science Center (Melinda Gates)  
Arizona State University, Tempe, AZ – AZ Biodesign I & II, APS Energy, LSW  
Cornell University, Ithaca, NY – Duffield Hall Nanotech Center  
Purdue University, IN -- Birck NanoTechnology Center & HDR Architecture, Inc.  
The Pennsylvania State University, State College, PA – Nanofabrication Lab.  
University of Waterloo – Waterloo, ON, Canada – Quantum Nano Center  
University of Maryland, College Park, MD – Laboratory for Physical Sciences (LPS)  
University of Oregon, Oregon Nanoscience & Microtechnologies Institute (ONAMI)  
University of Florida, Gainesville, FL – Nanoscience Institute (NIMET)  
University of Cork, Cork, Ireland – Nanofabrication Facility Project  
University of Virginia, Charlottesville, VA – MSENT Building  
University of Alberta, Edmonton, Canada – NINT Building, CCIS I&II  
University of Texas at Arlington – Chemistry & Physics Building (Nanotech Labs)  
University at Buffalo – BioMedical Research Bldg. & SUNYAB Allen Hall  
University of New Mexico, Logan Hall – EEG Laboratory  
University of Missouri - University Hospital, Columbia, MO.  
University of Pennsylvania, Health Sciences Facility  
University of Michigan, Ann Arbor, MI. – Commons Building  
University of California Berkeley, San Francisco, CA. – CITRIS project  
University of British Columbia – Michael Smith Laboratory  
University of Mexico, Nanotechnology Research Facility & HDR  
George Washington University, Washington, DC., EEG Laboratory – Ross Hall  
McMasters University, Canada – Nanotechnology Research Center  
Marquette University, Milwaukee, WI. – Microneurography Laboratory  
Yale University School of Medicine, CT. - P.E.T. Facility  
Wake Forest University, Winston-Salem, NC. – PTRP Biotechnology Research Bldg.  
Harvard University, Boston, MA – Cruft Lab, Northwest Labs, LISE Project  
Johns Hopkins University, MD. - Mudd Hall, Bloomberg School of Public Health  
Johns Hopkins University, MD. – Bayview Medical Center  
NASA Cleveland, Glenn Research Center, SEM Laboratory  
Philip Morris, Richmond, VA. - SEM Laboratory  
Monell Chemical Senses Center, Philadelphia, PA. – SEM Laboratory  
Raytheon, Boston, MA. – SEM/TEM Laboratory

New York University (NYU) School of Medicine – Smilow Research Center  
Fuji Film – Microelectronic Materials, USA Inc., North Kingston, RI.  
UC at Berkeley – Campbell Hall Replacement Building  
IBM - TJ Watson Research Center, Yorktown, NY – IDC TEM EMI Project  
Texas Tech University, Lubbock, TX. – EEG Laboratory  
Thomas Jefferson National Accelerator Facility, Newport News, VA  
Tulane University, New Orleans, LA. – Monroe Hall  
Michigan State University, Lansing, MI. – SEM Laboratory  
Oklahoma State University, Stillwater, OK. - Venture 1 Project  
Lawrence Berkeley National Labs, California – Molecular Foundry Building  
Brookhaven National Labs, NY – Center for Functional Nanomaterials & HDR  
Naval Research Laboratory (NRL), Washington, DC – NanoScience Research Lab  
Sandia National Labs, NM – Center for Integrated Nanotechnologies & HDR  
Lawrence Livermore National Laboratories, Livermore, CA – Nano-Research Lab  
Virginia Polytechnic Institute and State University, Blacksburg, VA.  
Syracuse University – Robert Menschel Media Center, Syracuse, NY.  
Lehman University, Bronx, NY.  
Columbia University (City of New York), NMR Research Bldg.  
Mary Washington Hospital & University Center, MRI Center  
Florida Atlantic University, S.E. Wimberly Library, Boca Raton, FL.  
Borough of Manhattan Community College, Dormitory Authority- State of NY.  
National Institute of Standards & Technology (NIST) -- Advanced Measurement  
Laboratory (AML) – HDR Architecture, Inc. Teaming Partner

**VitaTech performed the following tasks for the above NanoTech projects:**

- 1) Full spectrum EMI/RFI site survey from DC to 18 GHz to evaluate the ambient EMF conditions of the proposed building site;
- 2) Simulated peak overhead/underground transmission/distribution line and selected building electrical system magnetic emissions, where necessary,
- 3) Simulated peak EMI emissions from nearby electric trolleys, subways and trains, where necessary;
- 4) Identified potential RFI problems from any nearby RF antennas (marine, mobile, broadcast, cellular/PCS, radar, microwave, etc.);
- 5) Generated scientific tool list with EMI/RFI susceptibility criteria ensuring maximum tool performance (i.e., SEM, TEM, STEM, E-Beam, FIB, NMR, MRI, etc.) after building is constructed and operational;
- 6) Reviewed construction design documents, provided detailed mitigation strategies (i.e., magnetic and/or RF shielding solutions, acceptable EMI/RFI separation distances, conduit types, twisted cabling, etc.) to minimize EMI/RFI problems, examined M.E.P. equipment (i.e., motors, fans, pumps, VFDs, dimmers, etc.), and the grounding system. Also minimized ground/net

- currents and potential localized EMI/RFI emissions from other nearby scientific tools and computers.
- 7) Performed Final Commissioning compliance EMI/RFI site survey when building was operational.

### Other University Projects

#### **George Washington University**

Psychiatric Laboratory, Medical College Center for Family Research  
Ross Hall, Washington, DC

Susan L. Warren, M.D., Director of Psychiatric Research (202) 994-0033

VitaTech conducted two EMF site surveys to design, fabricate, and install an AC ELF and RF (radio frequency) 2850 ft<sup>2</sup> shielding system for Dr. Warren's new Psychiatric Research Suite, on the 5<sup>th</sup> floor in Ross Hall. The AC ELF/RF shield installed by VitaTech enclosed two procedure rooms and observation room with seam welded aluminum plates, copper/aluminum mesh, honeycomb and EMI power filters. The shield significantly attenuated both electric and magnetic fields from 30 Hz to over 3 GHz, which includes AC ELF EMI (electromagnetic interference) sources and RFI (radio frequency interference) sources to less than 0.01 mG and 0.0 V/m, respectively. The shielded areas provide a very low EMI/RFI environment for a wide variety of complex biomedical research instruments (i.e., EEGs, EMGs, EKGs, etc.).

#### **Mayo Clinic - Facilities**

Rochester, Minnesota

Kenton R. Kaufman, Ph.D., P.E.

Associate Professor of Bioengineering (507) 284-2262

VitaTech Engineering conducted an AC/DC ELF and RF site survey at the Rochester, Minnesota office to provide an EMI/RFI assessment of a biomechanics laboratory and motion analysis laboratory. EMI/RFI risks were evaluated based upon building design/electrical plans and simulated magnetic field levels under peak and worst-case load scenarios.

#### **Johns Hopkins University**

Applied Physics Laboratory

Laurel, Maryland

1Bill Kozak, Director of Facility & Plant Administration (443) 778-5137

Elevated magnetic fields up to 50 mG on the floor emanated into two research offices and a reception area from the main building switchgear room below in Building #1 at

Laurel, Maryland, campus. A 600 square-foot dual-substrate AC ELF magnetic shield was designed (provided detailed engineering drawings, shielding materials list and installation instructions) by VitaTech and installed by technicians at the Applied Physics Laboratory under our direct supervision. Under maximum building loads the floor and 1-meter emissions were reduced to 5-mG and less throughout the shielded area. A special removable window shield was designed to accommodate maintenance of the window heater unit. VitaTech issued *Certificates of Shielding Performance* guaranteeing 5-mG and less under all building loads within the shielded offices.

**HDR Architecture, Inc. (Teaming Partner)**

1101 King Street, Suite 400  
Alexandria, VA 22314

David Bechtol, HDR Vice President (703) 518-8528

VitaTech was awarded a contract by HDR Architecture, Inc. of Alexandria, Virginia, to evaluate potential EMI (and RFI) problems from AC ELF power sources inside the building within all laboratories at the new National Institute of Standards & Technology (NIST) Advanced Measurement Laboratory (AML) in Gaithersburg, Maryland. NIST set criteria is 3 mG or less within the central portion of any lab, one-meter off each side wall and corridor wall, two-meters off the service galley wall and from the floor up to two-meters above the floor. VitaTech performed AC ELF magnetic field simulations from the busways located in the upper galley and from several transformers (fully loaded and balanced). Magnetic flux density levels were predicted at specific thresholds (i.e., 10 mG, 5 mG and 3 mG) from the main transformer vaults, switchgear rooms, UPS systems and various mechanical systems throughout the building. Furthermore, VitaTech assessed the RFI shielding effect of the metal panel demountable wall systems under consideration separating each laboratory. VitaTech recommended and designed AC ELF magnetic shields for the galley transformers and nearby service panels to ensure the 3 mG performance criteria within all the labs.

**University of New Mexico**

Psychology Department Logan Hall  
Albuquerque, NM 87131

Dr. Akaysha Tang, Ph.D., Research Director (770) 277-4931

VitaTech Engineering was contracted by Drs. Akaysha Tang Ph.D. and Clifford Saron Ph.D. of University of New Mexico to design, install, test and certify a AC ELF EMI/RFI magnetic shield. VitaTech installed a 9' x 12' x 8' (height) shield composed of conductive seam welded aluminum plates and extruded aluminum I-Beams. Additionally, an RF sealed door and filtered penetrations for HVAC and signal cables were installed to complete the design. Low (0.1-9.99 mG) AC ELF magnetic emissions emanated into the area from 60 Hz sources inside the room and from the electrical closet located across the hallway. In addition, the high frequency noise from multiple sources needed to be attenuated for the newly proposed EEG laboratory. The shield

provided an environment free from EMI (electromagnetic interference) and RFI (radio frequency interference) attenuating the fields to 0 mG and 0.0 V/m.

**Massachusetts Institute of Technology (MIT)**  
Hudson Magnetoencephalography (MEG) Laboratory  
Cambridge, Massachusetts

VitaTech Engineering provided electromagnetic interference (EMI) consultation services to identify and analyze possible sources of EMI from a motor/pump room adjacent to a laboratory housing sensitive magnetoencephalography (MEG) devices. VitaTech analyzed building plans, MEG specifications, and high-tech computer-simulated magnetic field emissions to evaluate the potentially disruptive EMI impacts.

**Singapore University**  
K.S. Lee & Associates  
Singapore

VitaTech Engineering was contracted to assess AC ELF magnetic field levels and provide a mitigation solution for laboratory clean rooms housing sensitive laboratory equipment and data recording equipment. Based upon building and electrical plans, VitaTech simulated AC ELF magnetic field emissions from adjacent electrical switchgear rooms and proposed a cost-effective solution as an engineering design of an AC ELF shielding system.