no longer produced making repairs difficult if not impossible. The main upgrade is replacing twelve old (1995) field programmable gate arrays (FPGAs) with a single Virtex II FPGA. The prototype was tested using computer synthesis tools, a commercial signal generator, and a fast pulse generator.

Using Boosted Decision Trees to Separate Signal and Background in B→Xsγ Decays. *JAMES BARBER (University of Massachusetts, Amherst, Amherst, MA 01003) PHILIP BECHTLE (Stanford Linear Accelerator Center, Stanford, CA 94025).* The measurement of the branching fraction of the flavor changing neutral current B→Xsγ transition can be used to expose physics outside the Standard Model. In order to make a precise measurement of this inclusive branching fraction, it is necessary to be able to effectively separate signal and background in the data. In order to achieve better separation, an algorithm based on Boosted Decision Trees (BDTs) is implemented. Using Monte Carlo simulated events, 'forests' of trees were trained and tested with different sets of parameters. This parameter space was studied with the goal of maximizing the figure of merit, Q, the measure of separation quality used in this analysis. It is found that the use of 1000 trees, with 100 values tested for each variable at each node, and 50 events required for a node to continue separating give the highest figure of merit, Q = 18.37.

Using LabVIEW for Complete Systems Control of an ECR Thin Film Deposition System. *BRANDON BENTZLEY (The College of New Jersey, Ewing, NJ 08628) ANDREW POST-ZWICKER (Princeton Plasma Physics Laboratory, Princeton, NJ 8543).* Interest in studying an electron cyclotron resonance (ECR) deposition system is fueled by ECR's better deposition rates and precision relative to traditional deposition systems; however, the ECR deposition system is extremely complex and requires that its gas flow control, magnets, 2.45 GHz source, and other components all work in concert. Operating the system requires an experienced user to constantly compensate for the dynamics of the system, such as argon gas pressure and magnetic field strength. A method of computer automation, such as LabVIEW, permits the system to operate itself, allowing for less experienced operators, reproducible conditions, and a safer working environment. LabVIEW, in conjunction with National Instruments hardware, sends and receives voltage signals and serial commands in order to control microwave power, magnet current, target bias voltage, vacuum and compressed-gas valve position, chamber pressure, and robotics commands. The VI takes many factors into account simultaneously, such as chamber pressure, ion current and spectroscopic data, in order to make decisions about the system state. LabVIEW was found to produce easy to manage, consistent, and reproducible conditions by simplifying complex procedures, such as system startup routines and robotics commands, to a click of a button, by compensating both accurately and quickly for changes in plasma conditions, and by checking the state of the system in order to prevent system malfunction.

Using Math Cad to generate a polynomial for comutation of beam position from Main Injector Extra-Wide Aperture Beam Position Monitor Electrode Signals. *MILTON SMITH (Southern University, Baton Rouge, LA 70807) ROBERT WEBBER (Fermi National Accelerator Laboratory, Batavia, IL 60510).* As far as mankind's knowledge of mathematical procedures, how it has influenced our lives by describing multiple scientific procedures. The research that was conducted sole purpose was to generate a polynomial that will compute beam positions based off measurements from two amplitude signal electrodes. Hence, the information from the BPM was compiled into data files which were separated into "horizontal" and "vertical" files. These files were received and dissected with the usage of an extraordinary mathematical computer software Math-Cad. Math-Cad gave the ability to manipulate the data files in order to generate such a polynomial that will compute beam position when only receiving signal amplitude measurements from two electrode plates. Hence, calculations of computed data, actual "on-axis" data, and plots expressed results where the best computed beam position should lie far within the allotted 50mm barriers of the BPM test stand. In conclusion, the polynomial successfully displayed computed beam position from receiving signal amplitudes from two electrode measurements. If you reduce the human and/or mechanical involvement it may decrease the error within the BPM test stand measurements.

Science Policy

Policy Analysis: Rapid Response Vaccine Development for Emerging and Emergent Infectious Diseases. *CATHERINE COLAIANNI (Duke University, Durham, NC 27708) THOMAS BATES (Lawrence Livermore National Laboratory, Livermore, CA 94550).* Despite billions of dollars spent in research and development, the U.S. is alarmingly under-prepared to defend against biological warfare. This is most notable when considering the availability of biodefense vaccines. Vaccine production facilities are disappearing, and the production methodology employed in most cases is slow, expensive and outdated. Additionally, there is no comprehensive capability or even a strategy to develop and produce vaccines rapidly as part of an emergency response to a new or emerging pathogen. To explore the current state of vaccine production and to consider possible new directions to enhance our national posture, we undertook a policy analysis starting with an in-depth review of the historical vaccine development cycle for Bacillus anthracis, including the time requirements and government funding. Next, we made simple projections for a similar path to develop vaccines for other NIAID Category A Priority pathogens. Finally, options were explored for new research and development directions (5 to 10 year timeline) to support a rapid vaccine development process amenable to emergency use. The long-term solution was assessed to be an end-to-end "pipeline approach" whereby either synthetic subunit or attenuated vaccines could be rapidly produced 'on-demand'; however, considerable research is still required for methods to rapidly identify virulence factors and antigenic regions.

The Economics of Sanctions — Iran. *PETER NEWMAN (Brigham Young University, Provo, UT 84604) GARIANN GELSTON, BARBARA REICHMUTH (Pacific Northwest National Laboratory, Richland, WA 99352).* Iran is currently pursuing an aggressive nuclear program with a declared goal of achieving long-term energy independence. While this is a worthwhile and generally accepted national planning objective, there is evidence to indicate that Iran's nuclear program may be driven by the desire to produce weapons. Talks are currently underway between the United Nations (UN) and Iran, in accordance with the Nuclear Nonproliferation Treaty, to halt Iran's uranium enrichment program; a precursor to nuclear weapons production. In the event UN–Iran talks fail, the United States Government is evaluating a sanctions package to levy against Iran to encourage their compliance. Gasoline is one commodity being considered for restriction. It is estimated Iran will consume 467,000 barrels per day (b/d) of gasoline in 2006, and import 182,000 b/d (nearly 40%) of that total; thus, making Iran vulnerable to sanctions against this commodity. In order to effectively sanction gasoline imports current and potential suppliers must be identified. Utilizing national and international statistical bureaus along with some information gathered from private firms a partial portrayal of gasoline imports into Iran can be illuminated. Measurement (unit) differences, accounting discrepancies, incomplete or omitted information, and the general lag in data accumulation pose a real problem in assembling an accurate and timely depiction of gasoline trade. While accounting discrepancies between statistical databases are non-reconcilable, determining trade quantities in spite of unit differences is possible. Adjusting for various units of measure is accomplished using specific gravities (density). Upon converting and compiling all data from various sources for years 2003–2005, approximately 50–75% of gasoline purchased by Iran can be characterized. Although these results will be useful in evaluating sanctions, they may be insufficient to create the desired economic impact. Further research is warranted to build upon these findings.

Uncertainty and Scale Issues in Linking Climate Change to the Watershed Scale: Ideas in Landscape Classification and Use of NASA Remote-Sensing Data. *KANG CHANG (University of Illinois at Urbana Champaign, Urbana-Champaign, IL 61820) KAREN L. STEINMAUS (Pacific Northwest National Laboratory, Richland, WA 99352).* This paper will identify various aspects of uncertainty in the water resource management decision making process in the face of future predicted climate changes. The focus of many current efforts is to understand global change at the watershed scale. However, methods for studying the watersheds are spatially smaller than the current methods of studying the impacts of climate change (GCMs 400km) yet the former methods are still at a larger scale than the study of the topographical intricacies that help to determine streamflow (landscape classification). The drive to elucidate other potential local environmental reactions stems from the fundamental and often forgotten truth that, we as living creatures depend on the services our ecosystems provide to us. Climate change is anticipated to impact a decidedly significant ecosystem service: water. There is projected to be an increase in the temperature of the Pacific Northwest (United States) which could mean increased winter streamflow and decreased spring streamflow in the Cascade Mountain Range (containing the Yakima river basin). The future supply complications are likely to stem from the smaller headwaters of the Yakima and apply to times of drought or flood. Future