During the 2009/2010 fiscal year, the USF External Matching Grant Program awarded 23 projects with 18 companies. The approved awards total $1,201,123 and include $1,501,976 in cash match and $1,836,592 in-kind match for a total investment of $4,539,691 in the program. The average total project value was $197,378 and the average award was $52,223. 46 students and 37 faculty have been supported by these funds. Projects were reviewed from the College of Engineering (20), College of Arts & Sciences (5), College of Medicine (5), College of Marine Science (2), and Mote Marine Laboratory (1).

Arslan, Huseyin “GSM Signal Identification, Synchronization, Demodulation”  
Department: Electrical Engineering  
Sector: Information Technology  
Partner: Tampa Microwave  
Location: Tampa, Hillsborough County  
FHTC Award: $10,000  
Cash Match: $10,000  
In-Kind Match: $10,000  
Total Project Cost: $30,000  
Students: 1  
Faculty: 1  
Abstract: Implement a software prototype for collecting GSM network measurements. The system shall sample the analog baseband GSM signal using a vector signal analyzer available at USF and perform any signal processing required to collect GSM measurements.

Bhansali, Shekhar “Rework and Evaluation of Sensors and Packages for Marine Deployment”  
Department: Electrical Engineering  
Sector: Microelectronics/Nanotechnology  
Partner: JCG Technologies  
Location: Clearwater, Pinellas County  
FHTC Award: $35,000  
Cash Match: $35,000  
In-Kind Match: $37,500  
Total Project Cost: $107,500  
Students: 2  
Faculty: 1  
Abstract: The bioMEMS and Microsystems group at USF has been working in the area of marine sensors for the past 9 years. One engineer from the MEMS group will be assigned to work with JCG onsite (at least 4 days a week). The team member will advise the chosen members of JCG on a first hand basis on the intricacies of sensor deployment and help analyze the failed packages. The packages will be studied to evaluate if the failures are wear & tear or does it seem to be a materials issue. If packages seem to suggest a materials failure and requires additional electron microscope analysis, JCG will directly contract with NNRC for the use of the equipment. USF will provide expertise in analysis of the results. USF agrees that this research contract is focused on helping JCG identify the problem and determine whether the problem can be solved by our group.
Djeu, Nicholas “Characterization of SERS Chemical Sensor”  
Department: Physics  
Sector: Microelectronics/Nanotechnology  
Partner: MicroMaterials, Inc.  
Location: Tampa, Hillsborough County  
FHTC Award: $15,000  Cash Match: $30,000  In-Kind Match: $45,000  
Total Project Cost: $90,000  
Students: 1  
Faculty: 1  
Abstract: SBIR Phase I (Department of Energy): USF proposes to characterize surface enhanced Raman (a spectroscopic technique used to study vibrational, rotational, and other low-frequency modes in a system) scattering (SERS) chemical sensors using sapphire fibers coated with gold nanoparticles. The sapphire fibers will have either a uniform diameter or a diameter-modulated tip. Initial studies will focus on aqueous solutions of R6G containing trace quantities of the dye. Later the investigators will be broadened to include trace chemicals of environmental concern as well as non-trace chemicals of industrial interest. A quantitative comparison of the probes with and without the diameter modulation will be made, with careful attention given to the morphology of the nanoparticle coating.

Dubey, Rajiv, “Analysis, Evaluation and Modification of a Vibrotactile Balance Prosthesis”  
Department: Mechanical Engineering  
Sector: Life Sciences/Medical Technologies  
Partner: The C.S. Draper Laboratory, Inc.  
Location: Tampa, Hillsborough County  
FHTC Award: $50,000  Cash Match: $50,000  In-Kind Match: $100,000  
Total Project Cost: $200,000  
Students: 2  
Faculty: 5  
Abstract: There is interest in developing balance prostheses that can ameliorate some of the deficits of stance and movement control associated with abnormal vestibular function and other sensory deficits. It is proposed that an evaluation and analysis of vestibular prostheses that alert the user of possible loss of balance be conducted and modifications implemented.

Highsmith, Jason “OttoBock X2”  
Department: Physical Therapy  
Sector: Life Sciences/Medical Technologies  
Partner: OttoBock Healthcare  
Location: Orlando, Orange County  
FHTC Award: $105,203  Cash Match: $210,526  In-Kind Match: $472,815  
Total Project Cost: $788,544  
Students: 4  
Faculty: 2  
Abstract: Alpha Testing of the new Otto Bock knee (Otto Bock X2 knee) will start in October 2009 during which transfemoral amputees will be fitted with Otto Bock X2 knee for a limited period of time. Following alpha-testing, Otto Bock X2 knee prototypes will be collected back from subjects in order to inspect the integrity/durability/potential problems with the knees.
Kumar, Ashok “Nanowires based Technologies for Biotoxin Detection”
Department: Mechanical Engineering
Sector: Microelectronics/Nanotechnology
Partner: Constellation Technology Corp.
Location: Largo, Pinellas County
FHTC Award: $100,000  Cash Match: $100,000  In-Kind Match: $101,000
Total Project Cost: $301,000
Students: 2
Faculty: 1
Abstract: There is an urgent and also long-term need to develop improved, integrated sensor for biosensing applications. This project will develop and show with a material and method perspective, how an amperometric biosensor can be fabricated by using Vapor Liquid Solid (VLS) method for detection of biotoxin. Since miniaturization is one of the important developments in biosensor technology, our current efforts will be directed to fabricate nanostructured electrodes, which can provide big surface areas following immobilization of a larger amount of enzymes. Performance of this sensor will be tested by using electrochemical techniques such as voltammetry, amperometry, and impedance spectroscopy. Successful conclusion of this project by designing and demonstrating the feasibility of a biosensor. Another important feature of this research program is to train graduate student in a fundamentally and technologically significant area of Nanotechnology at the University of South Florida.

Larsen, Randy, “Development of Novel Porphyrin Based Threat Agent Sensors”
Department: Chemistry
Sector: Microelectronics/Nanotechnology
Partner: The C.S. Draper Laboratory, Inc.
Location: Tampa, Hillsborough County
FHTC Award: $46,234  Cash Match: $92,467  In-Kind Match: $49,560
Total Project Cost: $188,261
Students: 4
Faculty: 1
Abstract: This project is to develop novel propheyrin based sensors for the detection of chemical and biological weapons agents. These new sensors will be developed for high sensitivity and high sensitivity being more advanced than currently available technology.

Lembke, Chad “Applying Sensor Observation Services to Marine Survey Applications”
Department: Marine Science
Sector: Marine Science
Partner: AEOS
Location: St. Petersburg, Pinellas County
FHTC Award: $12,750  Cash Match: $12,750  In-Kind Match: $12,750
Total Project Cost: $38,250
Students: 2
Faculty: 1
Abstract: This project will result in the development and testing of a database designed and built to accommodate a large array of sensor data streams commonly utilized within the College of Marine Science and by AEOS. After the database streams are identified, a specific set of data sets will be selected for test data collection operations utilizing AEOS’ Unmanned Surface Vehicle (USV) system equipped with the selected sensors. The USV will then be deployed to collect a minimum of three unique data sets for use in project demonstration.
Luer, Carl “Pathways of Programmed Cell Death in Tumor Cells Exposed to Shark Immune Cell-Derived Peptides”  
Department: Mote Marine Laboratory  
Sector: Marine Science  
Partner: Mote Marine Laboratory  
Location: Sarasota, Sarasota County  
FHTC Award: $50,000  Cash Match: $50,000  In-Kind Match: $50,000  
Total Project Cost: $150,000  
Students: 2  
Faculty: 2  
Abstract: Previous studies in Mote Marine Laboratory’s Marine Biomedical Research Program have demonstrated that the protein-enriched culture medium from short-term cultures of shark immune cells possesses potent antitumor activity against a variety of human tumor cell lines. The long-term goal of the research is to identify novel anti-tumor compounds with the potential for development into improved therapies for cancer treatment. The studies for which funds are being requested will provide information on the cellular pathways used by the shark immune cell factors to inhibit tumor cell growth.

Mohapatra, Subhra, “Targeting of Curcumin-genistein Nanocomplexes for Treatment of Prostate Cancer”  
Department: Molecular Medicine  
Sector: Life Sciences/Medical Technologies  
Partner: Transgenex Nanobiotech, Inc.  
Location: Tampa, Hillsborough County  
FHTC Award: $95,829  Cash Match: $95,829  In-Kind Match: $96,800  
Total Project Cost: $288,458  
Students: 3  
Faculty: 2  
Abstract: Theranostics, a fusion of diagnostic and therapeutic approaches, aim to detect cancer cell and simultaneously treat. Such approach would target the therapeutics to cancer cells and thereby eliminate unnecessary toxicity associated with systemic drug delivery. Preliminary results have led to the hypothesis that natriuretic peptide receptor A (NPRA) signaling plays a critical role in prostate cancer progression and metastasis, and this NPRA can serve as a theranostic target for prostate cancer. To test this hypothesis, we propose to develop a NPRA-based theranostics and test its potential in attenuating prostate cancer in mouse model.

Muller-Karger, Frank “Improving the NOAA NMFS and ICCAT Atlantic Bluefin Tuna Fisheries Management Decision Support System”  
Department: Marine Science  
Sector: Information Technology  
Partner: Roffer’s Ocean Fishing Forecasting Service  
Location: Melbourne, Brevard County  
FHTC Award: $110,718  Cash Match: $110,718  In-Kind Match: $130,000  
Total Project Cost: $351,436  
Students: 2  
Faculty: 1  
Abstract: The activity seeks to improve the existing National Oceanic and Atmospheric Administration’s (NOAA) and National Marine Fisheries Service (NMFS) decision making system for population assessment and management of Atlantic Bluefin Tuna.
Ranganathan, Nagarajan “VLSI Clock Control Mechanism”
Department: Computer Science Engineering
Sector: Microelectronics/Nanotechnology
Partner: East-West Innovation Corporation
Location: Largo, Pinellas County
FHTC Award: $10,079  Cash Match: $10,079  In-Kind Match: $10,079
Total Project Cost: $30,237
Students: 1
Faculty: 1
Abstract: Study of circuit structures that are needed to incorporate the proposed clock control mechanism and finalize the circuit structures considering various alternate options for implementing the phase shifting concept in VLSI circuits. The modified circuit to include the mechanism needs to be verified to ensure timing and the delay overhead of inserting additional circuitry to accommodate the new clocking scheme should be minimal and be absorbed within the amount of phase shifting on the clock signal controlling the specific path and this is extremely important to make sure the new clocking superimposed does not affect the original timing specification.

Ranganathan, Nagarajan “VLSI Clock Control Mechanism” Supplemental Funding
Department: Computer Science Engineering
Sector: Microelectronics/Nanotechnology
Partner: East-West Innovation Corporation
Location: Largo, Pinellas County
FHTC Award: $21,348  Cash Match: $21,348  In-Kind Match: $21,348
Total Project Cost: $64,044
Students: 1
Faculty: 1
Abstract: Our goal is to embed the delay due to additional circuitry within the available slack to achieve no-delay overhead mechanism. The circuit structures and algorithms developed as part of this research will be validated using the ISCAS’85 benchmark circuits. A commercial technology mapper may be used to do the initial technology mapping and generate the structural netlist. Timing correctness of the circuit optimized with the proposed idea will be verified using extensive functional simulations. Peak power reduction after applying the proposed idea will be estimated by using detailed SPICE simulations.

Sarkar, Sudeep “Avatar DNA Using Biometrics and User Access Controls”
Department: Computer Science Engineering
Sector: Information Technology
Partner: Raytheon
Location: St. Petersburg, Pinellas County
FHTC Award: $14,250  Cash Match: $28,500  In-Kind Match: $14,250
Total Project Cost: $57,000
Students: 1
Faculty: 2
Abstract: Raytheon would like to investigate concepts in developing a secure virtual world. In particular exploring the security features associated with the Avatar DNA using the combination of a biometric attribute (i.e. finger/thumb, palm face and or iris) and logical access controls mechanisms such as user privileges, profiles, and auditable actions bound together to create the unique accountability of individuals during a login session within the virtual world.
Department: Chemical Engineering  
Sector: Microelectronics/Nanotechnology  
Partner: Misty Development, Inc.  
Location: Tampa, Hillsborough County  
FHTC Award: $100,000  Cash Match: $100,000  In-Kind Match: $100,000  
Total Project Cost: $300,000  
Students: 2  
Faculty: 5  
Abstract: Application of chemicals to non-woven and woven textiles provides an avenue to impart unique properties such as heat retention and heat generation. The objective of this work is to design and develop products and design facilities for such specialized textile applications.

Sunol, Aydin “Development and Characterization of Organic-inorganic Nanocomposite Foams”  
Department: Chemical Engineering  
Sector: Microelectronics/Nanotechnology  
Partner: Advanced Material Technology  
Location: Tampa, Hillsborough County  
FHTC Award: $33,000  Cash Match: $33,000  In-Kind Match: $33,000  
Total Project Cost: $99,000  
Students: 3  
Faculty: 1  
Abstract: The project will focus on developing new multifunctional insulation materials that will impact cryogenic systems for space transportation orbit transfer vehicles, space power systems, spaceports, spacesuits, lunar habitation systems, robotics, and in situ propellant systems.

Sunol, Aydin “Development of Nano-composite Micro Foams Using Supercritical Fluids”  
Department: Chemical Engineering  
Sector: Microelectronics/Nanotechnology  
Partner: Advanced Material Technology  
Location: Tampa, Hillsborough County  
FHTC Award: $15,000  Cash Match: $15,000  In-Kind Match: $15,000  
Total Project Cost: $45,000  
Students: 2  
Faculty: 1  
Abstract: The project is aimed at developing new cryogenic insulations for passive thermal control, resulting in zero boil-off storage of cryogens. The passive thermal control will serve to limit the heat leak into the cryogenic storage system. The proposed technology is expected to increase reliability, increase cryogenic system performance, and is capable of being made flight qualified for the flight systems and to meet Exploration Systems mission requirements. We propose to develop advanced closed cell organic/inorganic hybrid microfoams offering affordable cost, lightweight, high strength, low thermal conductivity, high thermal stability, and easy processability which will result in improved efficiency and reliability of the cryogenic systems. The proposed Supercritical Fluid Aided Foaming approach will be environmentally friendly and will not emit any volatile organic compound (VOC). The closed cell structure of these novel foams will prevent the occurrence of cryopumping.
Wang, Jing, “Uncooled Nanoscale Infrared High-Speed Sensors for Missile Seeker Applications”
Department: Electrical Engineering
Sector: Microelectronics/Nanotechnology
Partner: NanoCVD Co.
Location: Tampa, Hillsborough County
FHTC Award: $79,156  Cash Match: $79,156  In-Kind Match: $160,168
Total Project Cost: $318,480
Students: 3
Faculty: 2
Abstract: There is a growing need for multi-spectral infrared detectors for advanced missile seekers with better target discrimination and identification. Multicolor capabilities, high detectivity and quick response are highly important for advanced infrared sensor systems. The company proposes developing uncooled high-speed detectors consisting of a microstrip-patch-antenna or dielectric-rod-antenna in conjunction with nanoscale metal-insulator-metal tunnel diode (MIMTD), which can be efficiently used in missile seekers and commercial applications. In these assemblies, a microantenna amplifies the incident electromagnetic radiation, and the induced infrared frequency voltage is rectified by the MIMTD generating a useful signal. Successful deployment of uncooled infrared high-speed sensors in accordance with the proposed effort will open up a wide range of applications ranging from missile seeker applications to driver’s night vision enhancement.

Wang, Jing “Research and Training Internship for Enhanced Characterization and Circuit Design”
Department: Electrical Engineering
Sector: Microelectronics/Nanotechnology
Partner: Modelithics
Location: Tampa, Hillsborough County
FHTC Award: $16,883  Cash Match: $16,885  In-Kind Match: $17,500
Total Project Cost: $51,268
Students: 3
Faculty: 1
Abstract: The goal of this on-going project will be to characterize (measure) example microwave devices and construct and verify improved models for high frequency transistors, such as Heterojunction Bipolar Transistors (HBTs) as well as field effect transistors of multiple types such as GaN HEMT, SiC MESFET, GaAs pHEMT, and Silicon MOSFET (LDMOS and VMOS). These models are going to be tailored for use in circuit simulation software such as Agilent ADS. Both frequency and time domain simulation capability is of interest. A goal will be transfer of developed techniques and complete modeling examples to Modelithics through collaborative research interaction between Modelithics’ engineers and USF students/faculty.
Wang, Jing “Miniature On-Chip Filter: Low Loss High-Q On-Chip Filter Arrays”
Department: Electrical Engineering
Sector: Microelectronics/Nanotechnology
Partner: Raytheon
Location: St. Petersburg, Pinellas County
FHTC Award: $94,997  Cash Match: $189,999  In-Kind Match: $150,000
Total Project Cost: $434,996
Students: 1
Faculty: 1
Abstract: As military systems migrate from single function RF (Radio Frequency) systems to multifunction RF systems, the rapid advancements of RF enabling technologies becomes more urgent. The Raytheon-wide team with university partners USF and UCB will design, develop and demonstrate on-chip RF tunable filter arrays from 100 MHz to 10 GHz. These filters are an important technology enabler for numerous Raytheon RF systems allowing for significant reductions in SWaP-C (Size, Weight, Power & Cost) with similar or improved system performance.

Wang, Jing, “Development of a High-Density Cylindrical Ion Trap Array Mass Spectrometer Using Micro-Fabrication Techniques”
Department: Electrical Engineering
Sector: Microelectronics/Nanotechnology
Partner: SRI International, Inc.
Location: St. Petersburg, Pinellas County
FHTC Award: $134,721  Cash Match: $134,722  In-Kind Match: $158,867
Total Project Cost: $428,310
Students: 2
Faculty: 2
Abstract: Under the scope of this project, USF will provide assistance for computer simulation of ion trap operation to guide design and operation, MEMS design and processing for fabrication and testing of MS arrays.
Weller, Thomas “Conformal Ferroelectric Antenna”  
Department: Electrical Engineering  
Sector: Aviation & Aerospace  
Partner: Raytheon  
Location: St. Petersburg, Pinellas County  
FHTC Award: $25,000  
Cash Match: $50,000  
In-Kind Match: $25,000  
Total Project Cost: $100,000  
Students: 1  
Faculty: 1  
Abstract: In order to support the on-going IDEA project on conformal ferroelectric antennas, a method for rapid and versatile characterization of barium strontium titanate thin films is necessary. Accordingly, this supplement request is intended to provide funding needed to validate a commercial ferroelectric tester. This instrument is an industry-standard tool that provides rapid characterization of deposited BST thin films, including testing of hysteresis loops and complex permittivity. This task will require approximately seven (7) months of graduate student effort to a) install the ferroelectric tester and become proficient with its use, b) optimize BST deposition parameters for devices to be used in the conformal ferroelectric antenna project, c) perform microwave characterization BST varactors, and d) develop non-linear equivalent circuit models for the varactors. The varactors addressed in this work will be designed to be consistent with the anticipated requirements for the tunable electronic band-gap (EBG) layer that will eventually be integrated with the conformal antenna.

Weller, Thomas “Ultra Low Power Electronics for Autonomous Micro-Sensor Applications”  
Department: Electrical Engineering  
Sector: Microelectronics/Nanotechnology  
Partner: Sciperio  
Location: Orlando, Orange County  
FHTC Award: $25,955  
Cash Match: $25,997  
In-Kind Match: $25,955  
Total Project Cost: $77,907  
Students: 1  
Faculty: 1  
Abstract: This project is related to a Phase I SBIR award received by Sciperio that targets the design of a Remote Lock-in Amplifier (RLIA). There are three main technical objectives for this proposed effort: 1) build a working demo of a Remote Lock-In Amplifier, 2) test the amplifier under known and repeatable noise conditions, and 3) validate networking capability. Building the RLIA will be done utilizing bench top equipment and standard antennas in order to rapidly demonstrate the system. A generic sensor will be designed to demonstrate and quantify the detection and extraction of small signals. The initial test for the device will be done in optimal, minimal-noise environments. Once the basic proof of principle has been seen, we will move to a controlled noise environment to demonstrate the true value of this device. USF will support the project by designing and fabricating the remote sensor device, and performing various types of device characterization.