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Selected sponsored research programs

Seamless Energy Balance Monitoring Device

NIH Award 2R44DK083141-02: 7/01/2008 – 03/31/2013
This SBIR Phase II project developed and investigated a novel earbud sensor for accurately measuring energy expenditure, for use in consumer fitness and clinical markets. Led to Valencell's PerformTek earbud offerings and the technology behind optical heart rate monitors on the market today.

Monolithic Multi-wavelength Blue-to-IR LED for Biomedical Diagnostics

NSF Award 0712295: 01/15/2009 – 12/31/2012
This STTR Phase II/IIB program, a collaboration between Valencell Inc & North Carolina State University, generated novel multi-wavelength pulse oximetry technology for noninvasive trans-dermal monitoring of various blood metabolites simultaneously in real time.

Seamless mobile health monitoring platform using novel informatics-based methods

NSF Award 0945307: 01/01/2010 – 12/31/2010
This SBIR Phase I program demonstrated the feasibility of a novel mobile health monitoring platform combining innovative sensors with informatics-based health assessment methods.

Seamless Energy Balance Monitoring Device

NIH Award 1R43DK083141-01A1: 7/06/2009 – 06/30/2010
This project demonstrated the feasibility of a novel earbud sensor for accurately measuring energy expenditure, for use in consumer fitness and clinical markets.

Wearable Photoelectrocatalytic Personal Environmental Exposure Monitor

NIH Award 1R43ES016400-01: 9/30/2007 – 08/31/2009
This project demonstrated the feasibility of a novel, wearable monolithic sensor/detector arrays for detecting various volatile organic compounds and toxic gases. These sensors used high energy (ultraviolet) photons to excite and functionalize oxide sensor surfaces instead of need to use high temperatures.

Nanopyramid Gas & Vapor Sensors

GE Advanced Energy CEO Program; 2005 - 2007
Development of wide bandgap MOSFET semiconductor devices and high temperature packaging schemes to build robust, efficient, high frequency power electronic switching circuits.

DARPA Robust Integrated Power Electronics (RIPE)

DARPA MTO Program: 2006 - 2007
Development of wide bandgap MOSFET semiconductor devices and high temperature, high frequency passives and packaging schemes to build robust, small, and reliable phased array radar power supplies.

Lockheed-Martin / GE Shared Vision High Density/High Temperature Power Converter

Lockheed-Martin: 2005 - 2007
Development of a high temperature capable power converter using SiC MOSFETs, SiC Schottky diodes and SiC PN diodes for rotating rectifiers. Involved significant materials characterization of SiC MOSFET oxides and reliability assessment using Time-dependent-dielectric-breakdown (TDDB) study.

Lockheed-Martin / GE Shared Vision Microwave

Lockheed-Martin: 2001 - 2006
Development of SiC MESFET and GaN HEMT L-, S-, and X-Band semiconductor RF devices for next generation phased array radar transmitters. Involved significant efforts in process improvements as well as long-term stability testing. Uncovered Vanadium doping contamination using deep level transient spectroscopy (DLTS) which caused MESFET threshold voltage shifting.

General Electric Harsh Environment Gas Sensors

GE Industrial "CEO Program": 2005 - 2007
Development of SiC MOSFET and GaN HEMT based transistor sensor devices for harsh environment measurement of various exhaust analytes such as NOx and SOx. Also included SiC high temperature supporting electronics such as operational amplifiers that can operate above 200°C.

Air Force Research Lab SiC Optically Triggered Thyristor

AFRL "Fly by Light" Program: 2004 - 2006
Development of an optically trigger (by UV light pulse) SiC 3kV Thyristor for aircraft motor control. This program successfully showed the first thyristors of their type. Device were evaluated for ability to improve EMI immunity of aircraft control systems.

Unison 3kV SiC Igniter Thyristor

GE Aircraft Engines / Unison "CEO Program": 2004 - 2005
Development of an 3kV SiC Thyristor for aircraft ignition. Devices were successfully built and tested and characterized for their usage in an arc-gap igniter system that could survive the high temperatures (300°C) of an aircraft engine enclosure.

General Electric GaN Power

GE Military Electric Power "Advanced Technology Program": 2002 - 2004
Development of GaN power diodes and SiC LDMOS devices. Involved early unit-process steps on wide bandgap materials processing such as etch, ion implantation, oxidation, etc. Also involved significant materials defect analysis and feedback to materials growers for improvement. Partners include Purdue, Cornell, and PowerEx.

General Electric UV SiC Photodiode Detector

GE Power Turbines "CEO" Program: 2001 - 2004

Development SiC photodiode to detect UV emissions from power turbine flame. Used to detect presence and quality of burn. Involved significant materials defect characterization. Uncovered a crystal defect that caused reliability issues of SiC diodes. Used Electron Beam Induced Current Imaging (EBIC) to image and show crystal defect growth with forward bias over long (30 minute+) durations which correlated with increased device on-resistance.