UNM leads $6 million grant to study electronics in extreme electromagnetic environments

Goal of research is to help manufacturers improve products

By Kim Delker — September 19, 2014

Categories: Electrical & Computer Engineering

Distinguished Professor of Electrical and Computer Engineering Edl Schamiloglu.

Imagine driving along the road, with no apparent signs of car trouble, then everything just stops — braking, acceleration, engine, electronics. Or picture yourself working on an important report, then your computer suddenly shuts down, unable to be revived.

Media Contacts

Kim Delker

(505) 277-5859
ksdelker@unm.edu

Related Images

Schamiloglu in his lab

Distinguished Professor of Electrical and Computer Engineering Edl Schamiloglu.

View Download (6.0 MB)

Useful Links

Schamiloglu receives highest level distinguished member

Although these scenarios may be caused by any number of factors, one possible cause could be something known as electromagnetic interference, when something interrupts or overloads the operation of an electronic component, often causing a ripple effect throughout the device.

Now a team from the University of New Mexico and the University of Maryland are collaborating to study this issue. The team received a six-year, $6 million grant that creates an Air Force Office of Scientific Research Center of Excellence focusing on the science of electronics in extreme electromagnetic environments.

“You can think of high-powered electromagnetics like a lightning bolt,” said Edl Schamiloglu, distinguished professor of electrical and computer engineering. “We know that you can have a power surge in a storm that can lead to blackouts. At one extreme, the impact of high-powered electromagnetics can be devastating like a lightning storm.”

Schamiloglu, the lead researcher on the project, said cars stopping and electronics going dead are extreme examples of the problem. What this team will be looking at is more subtle: how high-power electromagnetics can stress electronics a little bit beyond their proper operating point, which can cause all kinds of unexpected and unpredictable behavior, including failure.

“All of the components in modern electronics are rated to operate within a certain specification,” he said. “So the idea we’re looking at is what happens if you take a single component, like a microprocessor that should be operating at 5 volts and now it’s operating a 6 volts? Stressing one component beyond specifications may not be too harmful, but what happens if everything gets stressed a little? How does the entire system respond?”

Schamiloglu said the intended outcome of the center’s research will be to come up with predictive models of how failure will happen.

“What we’re after is attempting to use science and our understanding to be able to predict when and how electronics will fail under stress. This is unlike earlier approaches that were employed that sought to create a database and use statistics to come up with probabilities of failure. If we can come up with science-based predictive models, then we could come up with techniques to mitigate against that,” he said.

The effort is being led by UNM. In addition to Schamiloglu, others on the UNM team include co-PI Greg Heileman,

award from IEEE
Schamiloglu awarded DURIP grant

Related News

UNM to ‘Howl@125’ for 90th Annual Homecoming through Sept. 27
Essence co-founder Ed Lewis returns to campus
UNM leads $6 million grant to study electronics in extreme electromagnetic environments
The Clery Act and Title IX protects students in similar, but different ways
Aggression and death in chimpanzee communities

Events

UNM@125 Premiere (9/23/2014)
Phi Theta Kappa Induction Ceremony (9/23/2014)
How to Train Your Dragon 2 - Mid Week Movie Series (9/23/2014)
3-D Chalk Painting Artist (9/24/2014)
Applied Mindfulness Skills Training

professor of electrical and computer engineering and associate provost; Sameer D. Hemmady, research assistant professor in electrical and computer engineering; Payman Zarkesh-Ha, associate professor of electrical and computer engineering; Zhen Peng, assistant professor of electrical and computer engineering; and David Dietz, research professor in electrical and computer engineering.

Schamiloglu said that although the primary purpose of the project is to collect information for the Air Force and its operations, the repercussions are likely to be much wider.

“The whole idea of electromagnetic threats is a burgeoning problem. This is something that concerns not just the military, but the banking system, the Internet, airports, radar systems, landing systems, guidance systems, hydroelectric dams, water supply, and the power grid,” he said. “The concern is our society is so dependent on electronics that if you were to remove a critical component somewhere it could lead to this unpredicted set of cascading failures.”

He said long-term impacts of the research could include helping electronics manufacturers improve their products.

“Some of our work could lead to published standards which could guide manufacturers when they make their products in the future to make them better so they are less vulnerable to potential threats,” he said.

Much of the research on the project will be conducted at UNM and is expected to begin this fall. Four UNM graduate students are expected to work on the project. The University of Maryland team will be looking primarily at how a model they pioneered — the random coupling model — can affect electronic systems.

Tags: electromagnetic interference | Air Force Office of Scientific Research Center of Excellence | research | Edl Schamiloglu | Greg Heileman | Sameer D. Hemmady | Payman Zarkesh-Ha | Zhen Peng | David Dietz

For more news, visit the UNM Newsroom and follow us on Twitter.

(9/24/2014 - 9/28/2014)
"Researching the Dead: HIPAA and the Common Rule" (9/24/2014)
More Events

UNM In The News

Headlines for Sept. 23
Headlines for Sept. 22
Headlines for Sept. 19
Headlines for Sept. 18
Headlines for Sept. 17
View All

Most Viewed
Most Shared

University Libraries receives grant to digitize newspapers
Experts to assess campus culture on Title IX issues
Folk healing through a MOOC
Holder knows UNM chemistry

University Communication & Marketing
MSC06 3745, Box 26
UAEC Building 85 , Suite 160
1 University of New Mexico
Albuquerque, NM 87131

Phone: (505) 277-5813
ucam@unm.edu