



for NARTE at very late notice, and to feature a full page article and promotional advertisement from NARTE in the Show Guide edition of *The EMC Journal*.

NARTE experienced an active two days at the exhibition and received almost 40 requests for information about our EMC and ESD programs. Encouragingly, many of the requests were from company and department heads seeking to certify a number of their staff members.

The exhibition was also attended by York University and Kent University, with York able to promote their recently received NARTE Authorized Test Center status.

It is anticipated that this event will become a regular feature on the NARTE calendar and one at which we might run a certification examination in the future.



Solar Flares Cause GPS Failures, Cornell Researchers Warn

Cornell researchers have discovered that strong solar flares cause Global Positioning System (GPS) receivers to fail. Because solar flares are generally unpredictable, such failures could be devastating for “safety-of-life” GPS operations such as navigating passenger jets, stabilizing floating oil rigs and locating mobile phone distress calls.

“If you’re driving to the beach using your car’s navigation system, you’ll be OK. If you’re on a commercial airplane in zero visibility weather, maybe not,” says Paul Kintner Jr., professor of electrical and computer engineering at Cornell and head of Cornell’s GPS Laboratory.

Alessandro Cerruti, a graduate student working for Kintner, accidentally discovered the effect while operating a GPS receiver at Arecibo Observatory in Puerto Rico, one of six Cornell Scintillation Monitor (SCINTMON) receivers. Cerruti was investigating irregularities in the plasma of the Earth’s ionosphere – a phenomenon unrelated to solar flares – when the flare occurred, causing the receiver’s signal to drop significantly.

To be sure of the effect, Cerruti obtained data from other receivers operated by the Federal Aviation Administration (FAA) and the Brazilian Air Force. He found that all the receivers had suffered exactly the same degradation at the exact time of the flare regardless of the manufacturer. Furthermore, all receivers on the sunlit side of the Earth had been affected.

The flare consisted of two events about 40 minutes apart. The first lasted 70 seconds and caused a 40% signal drop. The second lasted 15 minutes and caused a 50% drop. But this flare was moderate and short-lived; in 2011 and 2012, during the next solar maximum, flares are expected to be 10 times as intense and last much longer, causing signal drops of over 90% for several hours.

“Soon the FAA will require that every plane have a GPS receiver transmitting its position to air traffic controllers on the ground,” warns Cerruti. “But suppose one day you are on an aircraft and a solar radio burst occurs. There’s an outage, and the GPS receiver cannot produce a location. It’s a nightmare situation. But now that we know the burst’s severity,

we might be able to mitigate the problem.”

The only solutions, suggests Kintner, are to equip receivers with weak signal-tracking algorithms or to increase the signal power from the satellites. Unfortunately, the former requires additional compromises to receiver design, and the latter requires a new satellite design that neither exists nor is planned.

“I think the best remedy is to be aware of the problem and operate GPS systems with the knowledge that they may fail during a solar flare,” says Kintner.

The team was initially confused as to why the flare had caused the signal loss. Then Kintner recalled that solar flares are accompanied by solar radio bursts. Because the bursts occur over the same frequency bands at which GPS satellites transmit, receivers can become confused, leading to a loss of signal.

Had the solar flare occurred at night in Puerto Rico or had Cerruti been operating SCINTMON only at night, he would not have made the discovery.

“We normally do observations only in the tropics and only at night because that’s where and when the most intense ionospheric irregularities occur,” says Kintner. However, since no one had done it before, Cerruti was looking at “mid-latitudes” (between the tropics and the poles), where weaker irregularities can occur both night and day. As a result, SCINTMON detected the solar flare.

Cerruti reported the findings on September 28 at the Institute of Navigation Meeting in Fort Worth, Texas, where he received the best student paper prize. The full results of the discovery will be published in a forthcoming issue of *Space Weather*. Other authors of the paper include D.E. Gary and L.J. Lanzerotti of the New Jersey Institute of Technology, E.R. de Paula of the Instituto Nacional de Pesquisas Espaciais and Cornell research associate Hien Vo.

EMC 2007: Launch of The Global EMC University

By Janet O’Neil, EMC 2007
Steering Committee Chair

At the 2007 IEEE International Symposium on Electromagnetic Compatibility (EMC 2007) in Honolulu, Hawaii, a new educational course will debut: The Global EMC University.

The goal of The Global EMC University is to provide in depth, applied, and practical material to those new to EMC. The course was designed to provide a solid foundation on important EMC topics to the practicing EMC engineer, presented by well-known EMC experts from universities or institutions around the world. These experts regularly gather at the annual IEEE EMC Symposium. For the first time, under the leadership of **Professors Clayton R. Paul** of Mercer University in Macon, Georgia and **Flavio Canavero** of the Polytechnic of Turin, Italy, these experts will share their knowledge following a structured agenda in a classroom type format.

The course curriculum includes:

- Professor Clayton Paul - Use of PSPICE in Solving EMC Problems
- Professor Flavio Canavero - Signal Spectra
- Professor Todd Hubing - Nonideal Behavior of Components
- Professor Mark A. Steffka - Conducted Emissions and Power Supply Filters
- Professor Andy Marvin - Antennas
- Professor Tom Jerse - Radiated Emissions
- Professor Christos Christopoulos – Shielding
- Professor Antonio Orlandi - Crosstalk
- Professor Kye Yak See - PCB Layout and System Configuration for EMC
- Dr. Al Ruehli - Transmission Lines and Signal Integrity

Nowhere else will one find these noted instructors in one place at one time for EMC education at this level!

Certificates of completion will be awarded and CEUs will be assigned; class size will be limited to ensure interaction with the speakers. Those that wish to attend should register early via the website www.emc2007.org. Registration opens January 5.