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Novel technique can improve electronics' robustness in space

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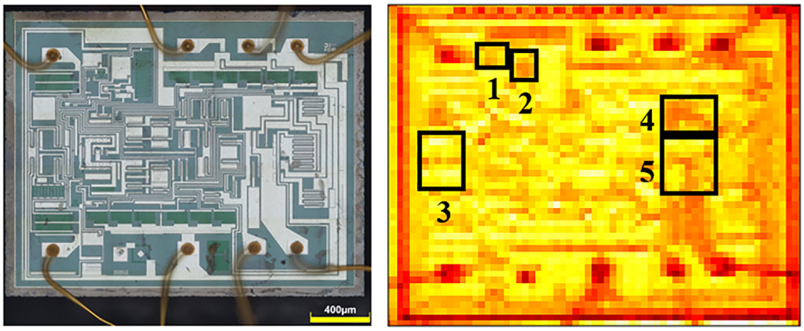
Heat wave method helps locate the high stress regions in electronics that are susceptible to radiation damage.



Electronics in space can be incapacitated by a single, errant charged particle. With the increased number of spacecraft deployments, researchers are looking for ways to ensure their electronic cargo is robust.

While managing risk is possible by identifying the most vulnerable components, the process is expensive and time consuming. Stepanoff et al. present a novel, faster approach to determining which areas of an electronic system are most susceptible to radiation damage.

"It is very important to know the survivability of electronics in radiation environments such as space, where cosmic rays and solar flares can easily damage the electronics that are so reliable on Earth," said author Aman Haque.

The researchers developed the technique by using heat waves. This approach aimed to detect microscopic areas with highly localized mechanical stress that could be damaged by a low-energy particle. In order for the technique to be efficient on large scales, the regions were intentionally approximated instead of precisely located.

Initial testing showed that high stress localized regions strongly influence the electrical sensitivity, meriting the approach. Further testing of the heat wave-based method was able to quickly detect sensitive areas without the need for specialized equipment. The technique provides an indirect but quicker pathway to the solution.

"We are very excited to demonstrate the potential of the new technique," Haque said. "We believe that the same principle can be used to make electronic devices resistant to radiation in a way that could replace radiation shielding and other existing systems."

The researchers plan to test their findings against conventional techniques that employ radiation facilities and calibrated hardware next.

Source: "Rapid detection of radiation susceptible regions in electronics," by Sergei P. Stepanoff, Aman Haque, Fan Ren, Stephen Pearton, and Douglas E. Wolfe, *JVST:B* (2023). The article can be accessed at https://doi.org/10.1116/6.0002689.