

# Radiation Tolerance of Applied Geomechanics Tilt Sensors

## Tech Note

In 1987 we delivered a large tiltmetering system to the Ásco 2 nuclear power plant for monitoring of foundation stability. As part of the acceptance process, four surface mount tiltmeters, Models 711 and 712, were subjected to accelerated aging tests in a radiation sterilization facility in southern California. The sensors in these tiltmeters are representative of all of the sensors used in our 500-, 700- and 800-Series tilt sensing products.

The tiltmeters were dosed with 0.36 to 9.76 megarads of gamma radiation from a cobalt 60 source. The dose rate was approximately 0.08 megarads/hour. The four tiltmeters were powered up during the testing and their output signals were recorded on instruments outside of the radiation chamber. The tests revealed the following:

- The integrated circuits on the printed circuit assemblies in the tiltmeters failed from radiation damage within one hour of the start of irradiation.
- Resistors and most capacitors continued to function after 9.76 megarads of irradiation.
- After irradiation was completed the damaged electronics were replaced with new electronics. The electrolytic tilt sensors in the units were then operated. The sensors appeared to function normally and to be undamaged even after 9.76 megarads of irradiation.

These results indicate that Applied Geomechanics electrolytic tilt sensors will perform successfully in high-radiation environments. However, the signal conditioning electronics necessary to operate the sensors will experience radiation damage. When tilt measurements must be made under radiation conditions, the solution is therefore to 1) shield the signal conditioning electronics or 2) locate the electronics in an area that is not irradiated. In the latter case the tilt sensors and electronics are connected by wires that may be up to 100 meters long.