Understanding the atomic-scale origins of radiation damage in semiconductor devices through electron paramagnetic resonance measurements

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The explosive growth of the semiconductor industry has been fueled by the ability to make increasingly faster, cheaper, and smaller transistors. Often present by the billions on a single chip, modern transistors have reached a size and complexity where a single atomic-scale imperfection (a broken bond for example) can wreak absolute havoc. Additionally, these types of defects can easily be generated just through normal use of a product, including via radiation damage. Understanding how they are created, what their physical and chemical nature is, and how they interfere with transistor operation is essential. This presentation will outline our work towards understanding these device killers, including development of novel electrical metrology and direct identification via electron paramagnetic resonance measurements.