

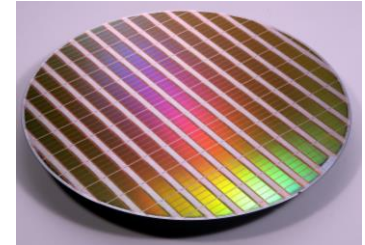


## Technology Commercialization Opportunity

### TDP Mapping™ - Terahertz Doping Profile Mapping

#### **Inventor(s):**

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#### **Technology Description:**

Modern electronics like computer processors and smart phones, as well as solar cells, rely on diodes and transistors. During their manufacturing a material, such as silicon, is imbedded or “doped” with other conductive materials with great precision. Present measuring techniques to verify these doping profiles are slow, destructive, off-line processes that can create waste and product deviation and failure.

Terahertz Doping Profile Mapping (TDP Mapping) is a new technique that uses noncontact, nondestructive Terahertz imaging that allows for rapid mapping of doping profiles at nanometer resolution levels. This new metrology technique is fast, reliable, cost-effective and has potential uses in R&D, process development and on-line quality control in manufacturing.

TDP Mapping measures the spectral fingerprint of the doping profile at any spot on a wafer. The depth profile of activated dopants is reconstructed accurately from this fingerprint in real time. By sampling several spots on a wafer the 3D profile of dopants both into and across the wafer can be determined non-destructively and rapidly. Execution of this technology is flexible because the measurement can be done either in transmission or reflection modes.

**Keywords:** Doping profile mapping, Diodes, Transistors, Quality control, Secondary Ion Mass Spectrometry, SIMS, Solar Cells, 3D Imaging, Semiconductor Doping

#### **Technology Readiness:**

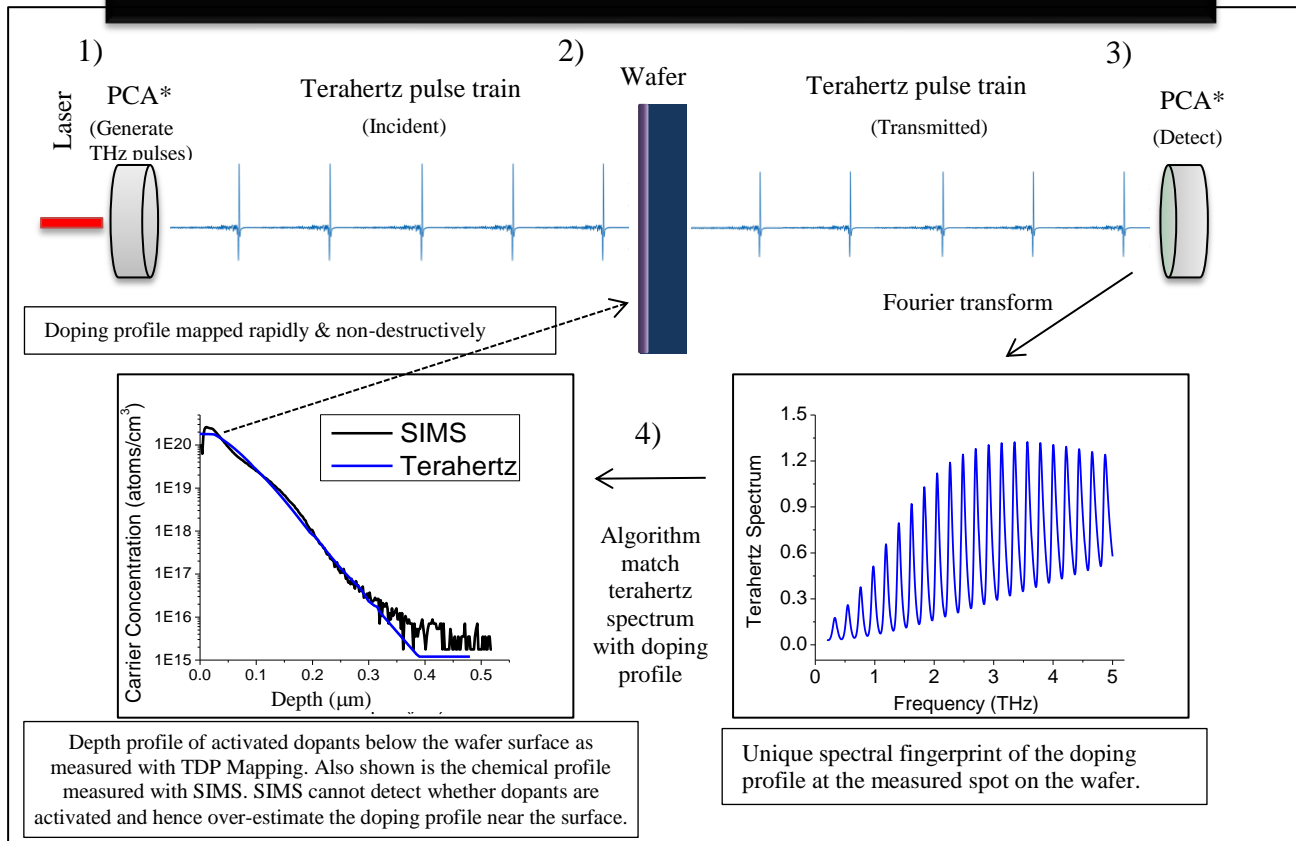
Proof of concept has been demonstrated in silicon diodes with sub 10 nm resolution.

Idea	Concept	Prototype	Alpha Version	Beta Version	Released
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#### **Intellectual Property:**

This technology is the subject of a pending U.S. patent, “Doping Profile Measurement of Semiconductor Devices Using Terahertz Time Domain Spectroscopy (THz-TDS)”

## Working principle of doping profile measurement with pulses of terahertz light.



\*Photoconductive Antenna

### Applications:

- Rapid non-destructive, non-contact testing of semiconductor doping profiles
- In-line quality control metrology during manufacturing
- Incorporate with techniques such as SIMS (to measure both chemical and activated profiles)
- R&D and process development

### Target Customers:

- Manufacturers of semiconductors, integrated circuits, solar cells, power electronics
- Metrology equipment manufacturers
- Testing laboratories
- SIMS equipment manufacturers for dual function systems

### Opportunity:

RIT's Intellectual Property Management Office (IPMO) is interested in working with those parties who are qualified and interested in the commercialization of the TDP Mapping technology. Arrangement types include licensing to existing organizations or new organizations that have expertise in the field or related fields. The inventors of the technology are available to work with licensees.

### Contact:

Those interested in learning more about this opportunity should contact: Mr. William E. Bond, Director of Intellectual Property Management, at RIT (585) 475-2986 or [bill.bond@rit.edu](mailto:bill.bond@rit.edu).

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