

## **Autonomous mm-Scale RFID Sensors for High Density In-Situ Soil Monitoring**

Better understanding of plant and microbial communities would be dramatically enabled by an ability to monitor their behavior in-situ, dynamically and in a variety of environments. To address this need, we are designing a mm-scale autonomous sensor platform that can incorporate on-chip and post-processed sensors to be deployed in order to monitor complex soil systems. The sensors are powered using RF energy harvesting with an on-chip antenna and therefore, do not require a bulky battery that needs to be replaced. Recent advances in sensor technologies, which allow a variety of sensor types to be post-processed on conventional CMOS, will expand the quantities which can be monitored. The small size of these sensors allows for high-density monitoring of soil. With in-situ sensing, we hope to enable monitoring of root architecture and growth; root exudates and enzymes; the dynamics of C, N, other nutrients and redox sensitive species; and gas and moisture fluxes among other applications.

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