

# RSoft Application: Plasmon Nano Probe

For Semiconducting Nanodevices and Biochemical Sensors

## Overview

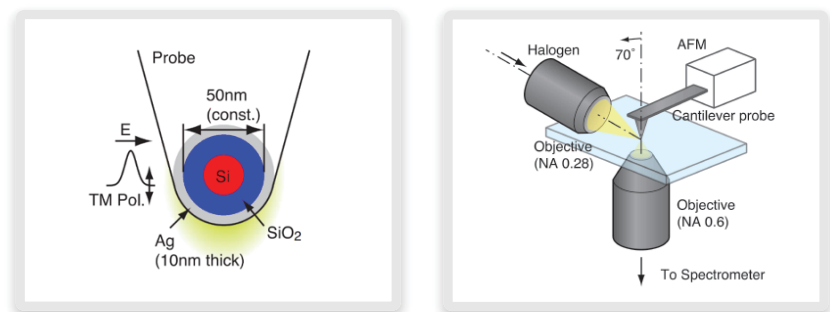
*SPM (Scanning probe microscopy) nanoprobes have been increasingly required for the electrical evaluation of semiconducting nanodevices, biochemical measurement of DNA and protein molecules, as well as nanoscale material property investigations. A U.S. microscope manufacturer and several research organizations in Japan and China have requested investigations of surface plasmon enhanced metallic nanoprobe behavior in various conditions.*

## The Challenge

- ▶ To obtain a strong enhancement effect, the plasmon resonance wavelength (PRW) of the metallic probe and the excitation wavelength need to be spectrally matched with each other.
- ▶ Considering the cost and limited number of laser sources, it is necessary to achieve the right combination and size of Si/SiO<sub>2</sub> in the probe tip to guarantee the best PRW match.

## The Solution

RSoft™ FullWAVE™, based on the FDTD method, is suitable for simulating nano-scale devices and surface plasmon effects. FullWAVE's enclosed launch feature allows for measurement of the probe's scattering-only properties.



**Figure 1. Diagrams of the Si probe and measurement setup.**  
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## The Result

FullWAVE provided the PRW peak shift positions and scattering strength change with SiO<sub>2</sub> thickness. It was also used to investigate the impact of environmental index change to understand measurement sensitivity.

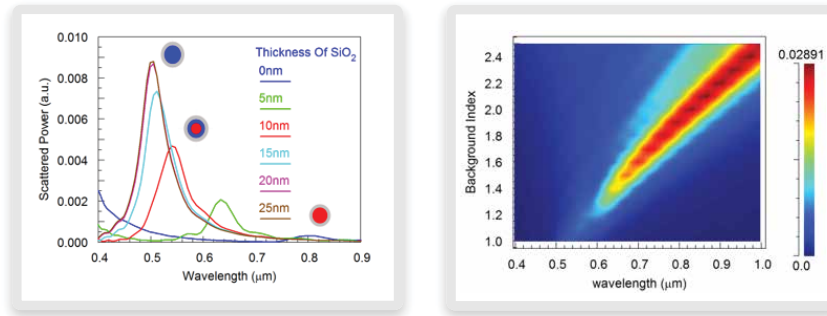


Figure 2. FullWAVE analysis results: a) Scattered power vs. wavelength for various SiO<sub>2</sub> thicknesses, and b) Scattered power vs. background index and wavelength.

For more information, please contact Synopsys' Optical Solutions Group at (626) 795-9101, visit <http://optics.synopsys.com/rsoft/>, or send an e-mail to [rsoft\\_sales@synopsys.com](mailto:rsoft_sales@synopsys.com).