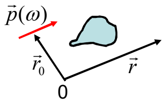
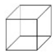
Field Susceptibility Method (Green's dyadic)



$$\vec{E}(\vec{r},\omega) = \underline{S}(\vec{r},\vec{r}_0,\omega)\cdot\vec{p}(\omega)$$

Field susceptibility (or Green's dyadic function or Field Propagator)

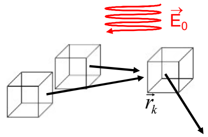
Incident field polarizes the cells
$\Rightarrow$ a dipole is induced



Polarization Polarizability

$$\vec{p}(r_k,\omega) = \chi(r_k,\omega)\cdot\vec{E}(\vec{r}_k,\omega)$$

Each induced dipole creates a field that interacts with each of the other cells

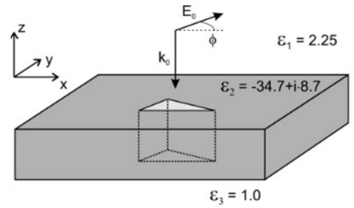


Induced field
$$\vec{E}(\vec{r},\omega) = \underline{S}(\vec{r},\vec{r}_k,\omega)\cdot\vec{p}(\vec{r}_k,\omega)$$

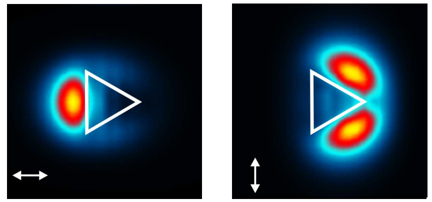
Lippman-Schwinger equation:

$$\vec{E}(\vec{r},\omega) = \vec{E}_0(\vec{r},\omega) + a^3\sum_{\text{all cells}}\underline{S}(\vec{r},\vec{r}_k,\omega)\cdot\chi\cdot\vec{E}(\vec{r}_k,w)$$

Numerical Simulation

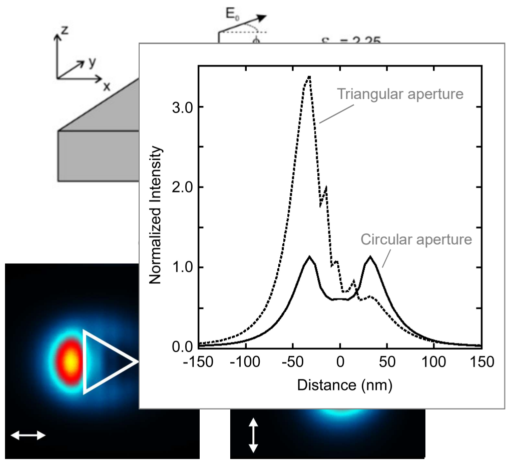


Calculated field intensity



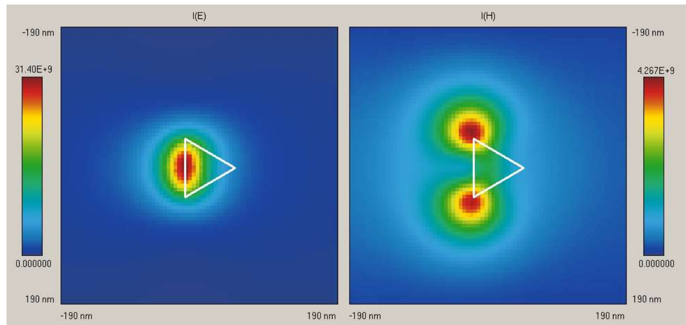
G. Colas des Francs et al. (2005)

Numerical Simulation



G. Colas des Francs et al. (2005)

Numerical Calculations: Electric and Magnetic Fields at a Triangular Aperture



Aperture side length: 80 nm
Gold thickness : 300 nm
Distance: 20 nm

Software: COMSOL

T. Ergin