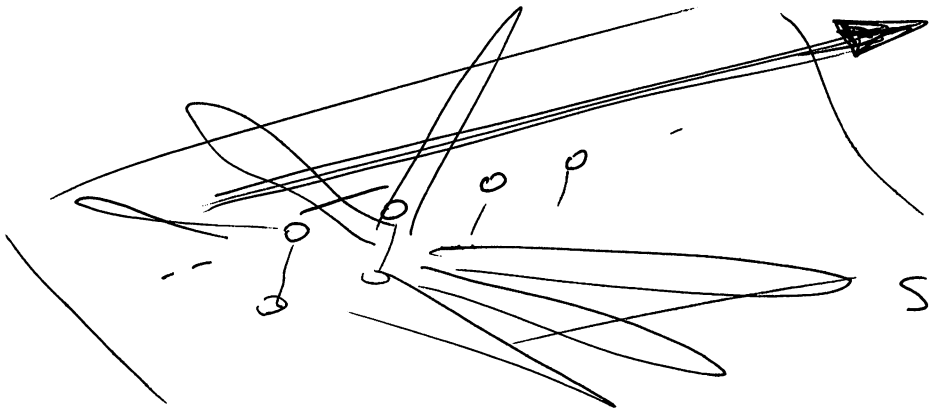
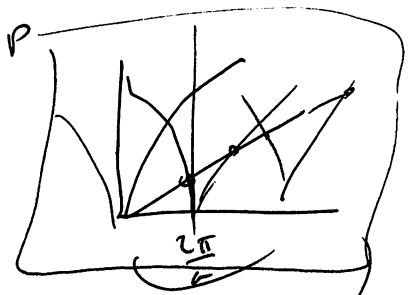
23-IX-2012

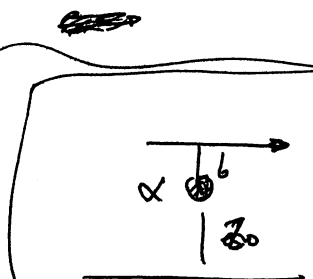
ICFO

SURFACE-POLARITON SMITH-PURCELL EFFECT



SP S-P




$\Gamma^{EELS} = \Gamma^{rad.}_{air} + \Gamma^{cc} + \Gamma^{SP}$

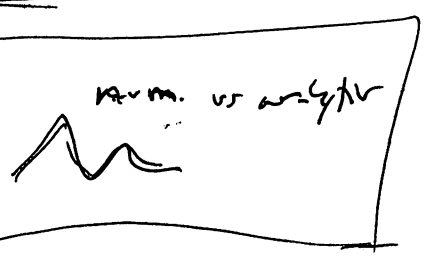
$\alpha$? a?

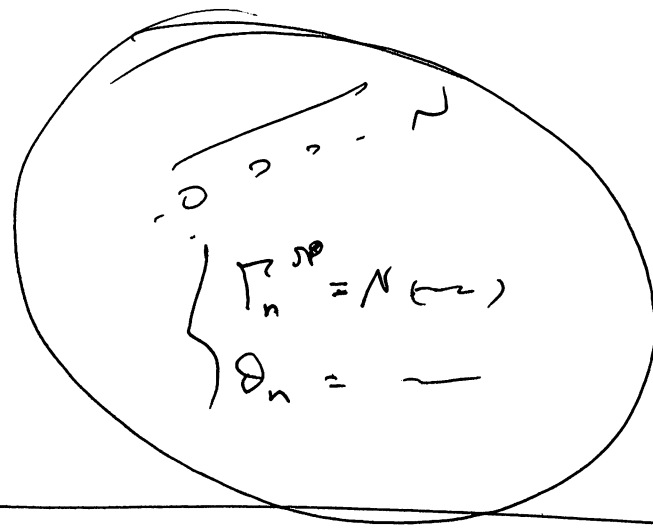
general solution → (c→∞) solution

$r_p \approx R_p \frac{K_p}{K_M - K_p}$

$K_p = g\,\omega^2$

↳ thin metal film



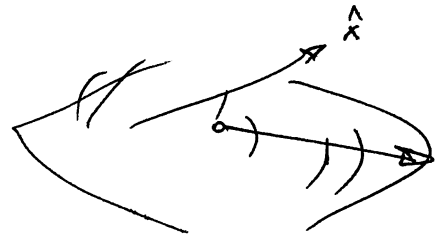




Graphene
hBN

$\epsilon \not\to \infty$

Si waveguide

$$\vec{P}(\omega) = \frac{1}{1/\alpha - G}\,\vec{E}^{ext}$$




$$\vec{E}^{surf}(\vec{r},\omega) \overset{z>0}{=} e^{i k_{zp} z} \left(\;\;\right) \frac{e^{i k_p R}}{\sqrt{R}}$$

p-pol.

$R \gg z_0, \lambda_p$

$$P^{sp} = \int_0^\infty d\omega \left|\;\;\right|^2 = \int_0^\infty d\omega\, P^{sp}(\omega)$$

$\propto |\vec{P}(\omega)|^2$

$|P_x(\omega)|^2$

$|P_z(\omega)|^2$


$A\,|P_x(\omega)|^2$

$+\,B\,|P_z(\omega)|^2$

$\propto |e^{i k_{zp} z_0}|^2$

$\mathrm{Im}\{G\} \rightarrow$ Purcell factor

$G(\omega, z_0)$ analytical

$$P^{sp} = C\,\frac{|e^{2i k_{zp} z_0}|^2}{|1/\alpha - G|^2}$$

Ω' UC

Ag film

graphene