Dans raf- og ljóseinda

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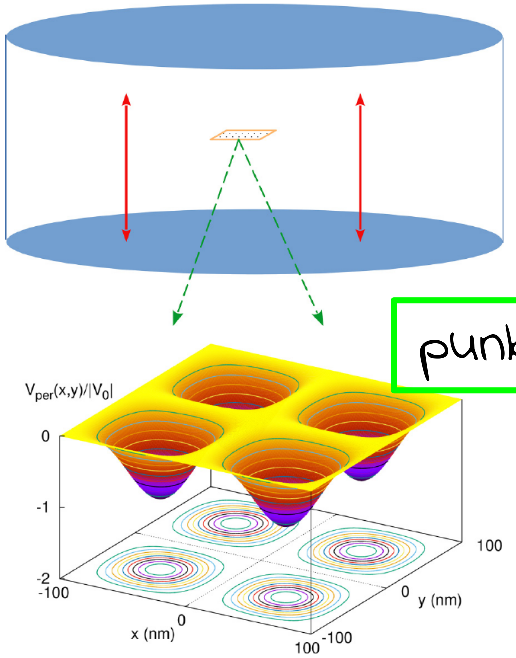
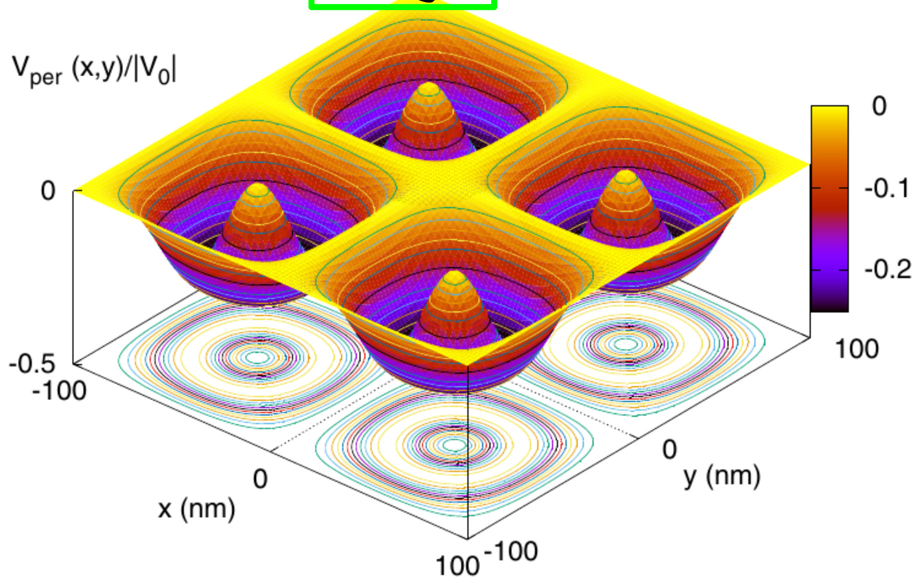
100 ára skammtafræði

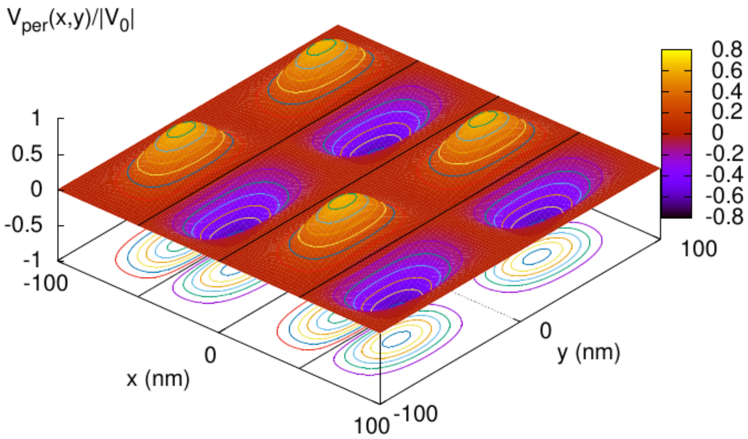
Tvívítt lotubundið rafeindakerfi í föstu ytra þverstæðu segulsviði sett í miðju sívalnings ljóseindahols

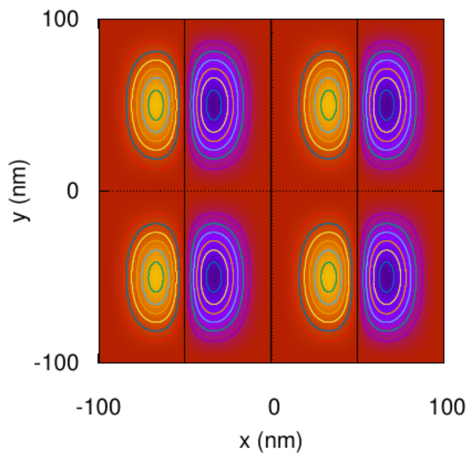


punktar

hringir







einingarlotur með samhverfubroti

Fjöldi rafeinda --> DFT (þéttleikafelli) fyrir Coulomb-víxlverkun þeirra

Víxlverkun raf- og ljóseinda

meðseglunarhlutinn

$$H_{\mathrm{int}} = \frac{1}{c}\int_{\mathbf{R}^2} d\boldsymbol{r}\, \boldsymbol{J}(\boldsymbol{r})\cdot \boldsymbol{A}_\gamma(\boldsymbol{r}) + \frac{e^2}{2m^*c}\int_{\mathbf{R}^2} d\boldsymbol{r}\, n_{\mathrm{e}}(\boldsymbol{r}) A_\gamma^2(\boldsymbol{r})$$

mótseglunarhlutinn

Vigurmætti ljóseindanna í TE011-hætti í langbylgjunálgun

skögpunar- og eyðingarvirkjar ljóss

$$\boldsymbol{A}_\gamma(\boldsymbol{r}) = \boldsymbol{e}_\phi \mathcal{A}_\gamma (a_\gamma^\dagger + a_\gamma)\left(\frac{r}{l}\right)$$

háð staðsetningu

því fæst

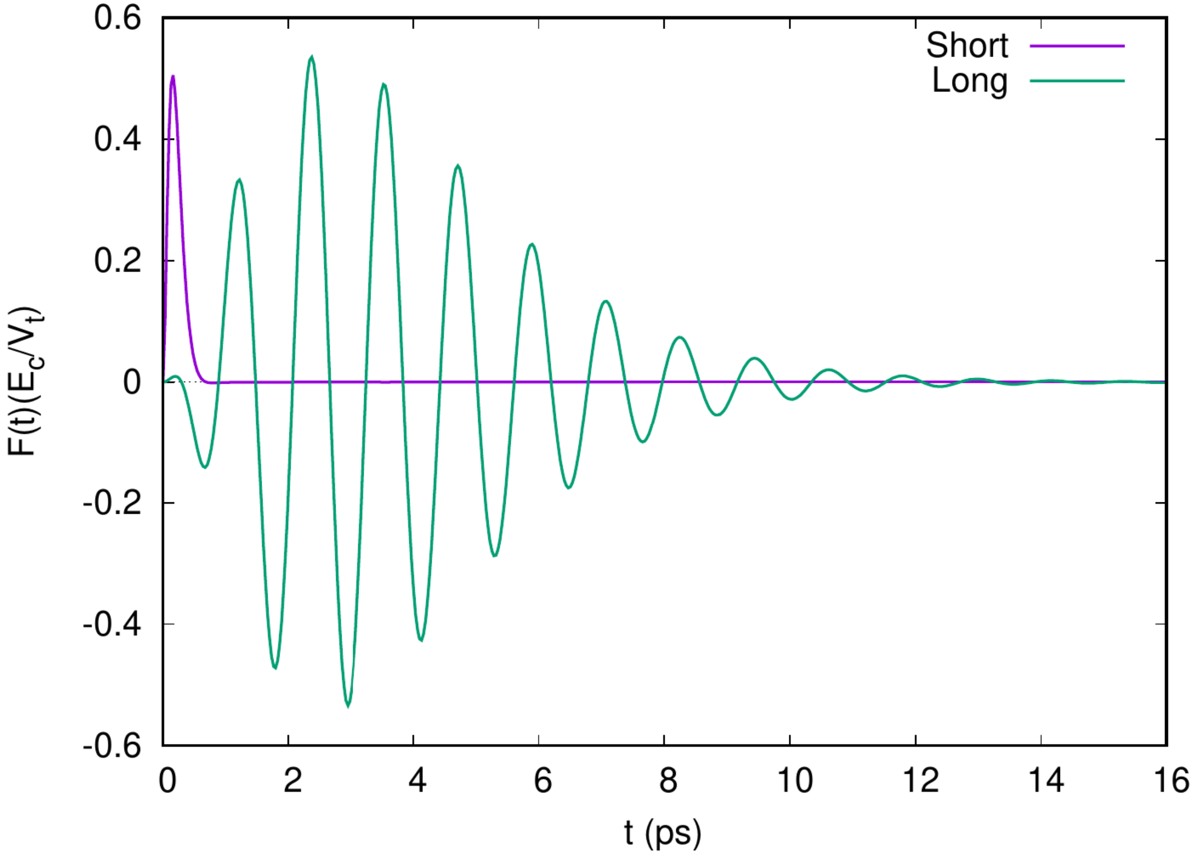
$$H_{\mathrm{int}} = g_\gamma \hbar\omega_c \left\{lI_x + lI_y\right\}\left(a_\gamma^\dagger + a_\gamma\right) + g_\gamma^2 \hbar\omega_c \mathcal{N}\left\{\left(a_\gamma^\dagger a_\gamma + \frac{1}{2}\right) + \frac{1}{2}\left(a_\gamma^\dagger a_\gamma^\dagger + a_\gamma a_\gamma\right)\right\}$$

með $\mathcal{I}_x$, $\mathcal{I}_y$ og $\mathcal{N}$ sem felli af n_e og J

Tímaþróun líkindavirkjans í hverjum punkti nykurrúmsins $\bar{\Theta}$

$$i\hbar\partial_t\rho^\theta(t) = [H[\rho^\theta(t)], \rho^\theta(t)]$$ ← jafna Liouville og von Neumanns

Kerfið leyst í þinilrúmi rafeinda og ljóseindaástanda $\{|\breve{\alpha}\rangle \otimes |n\rangle\}$
eftir upphafsörvun



Tímaháð meðaltöl ljóseindafjölda, N_γ, brautar-hverfiþunga Q_j, staðsetningar massa miðju $\langle x\rangle$ $\langle y\rangle$ og fjórpólsvægis Q_2 reiknuð

og Fourier-greind

GaAs-stikar notaðir

Samhverf einingarlota --> engar beinar raftvískautsfærslur

Ljóseindirnar bera hringlaga tímaháð rafsvið í 2D-sléttunni og segulsvið þvert á hana

Sívalningshol --> segulfærslur, segultvískauts og hærri ...

Lorentz-krafturinn fyrir tímaóháða kerfið tengir hring- og öndunarhreyfingar rafeindaþétt.
sama gerist í tímaháða kerfinu vegna tímaháða segulsviðsins

Skoðum kerfi með brotna samhverfu í einingarlotunni

Munum að segulsviðið brýtur rúm og t-samhverfuna

$N_e = 1$, $pq = 1$

$E_\gamma = 0{,}7$ meV, $g_\gamma = 0{,}08$

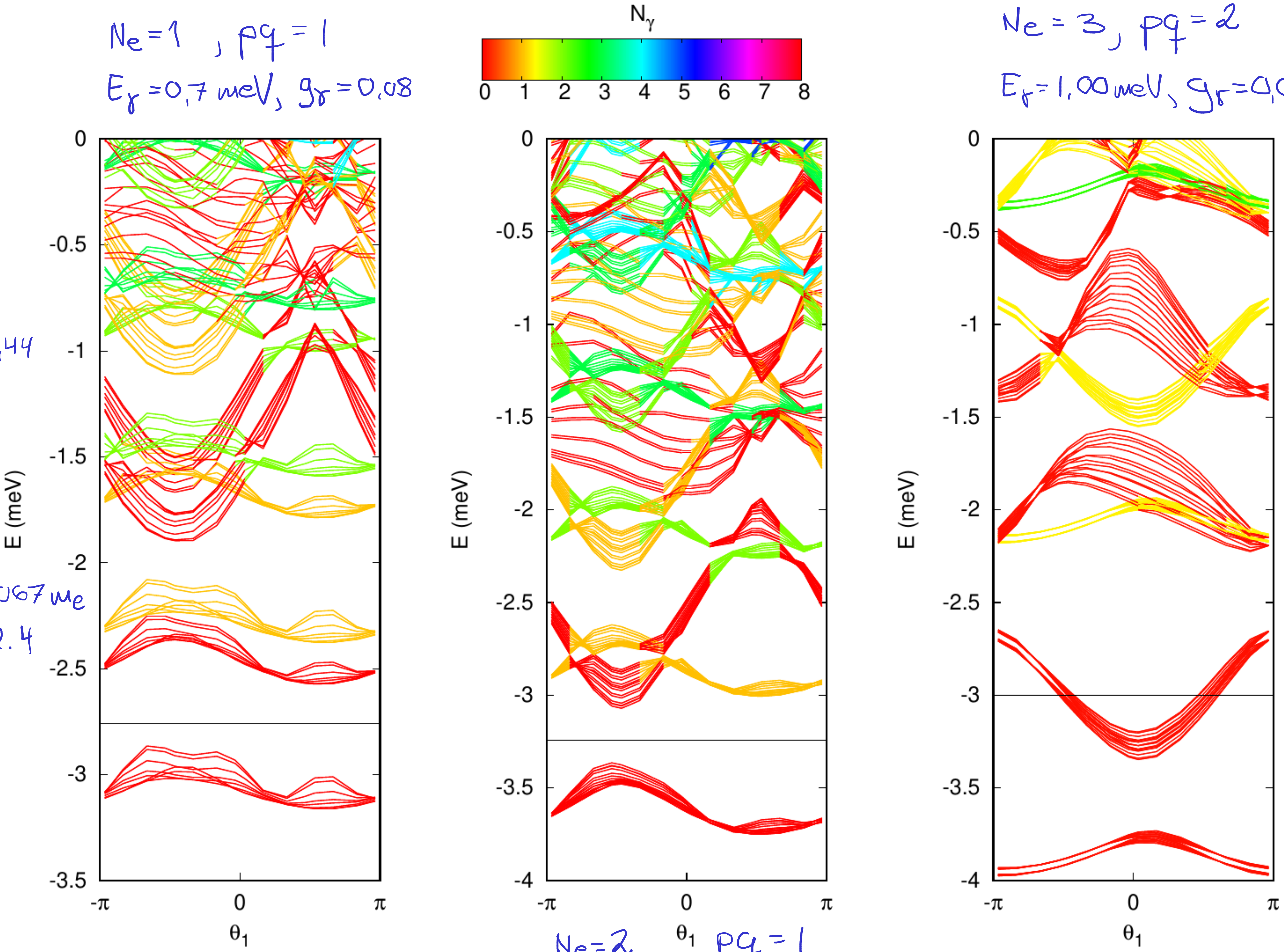
$N_e = 3$, $pq = 2$

$E_\gamma = 1{,}00$ meV, $g_\gamma = 0{,}08$

$g^* = -0{,}44$

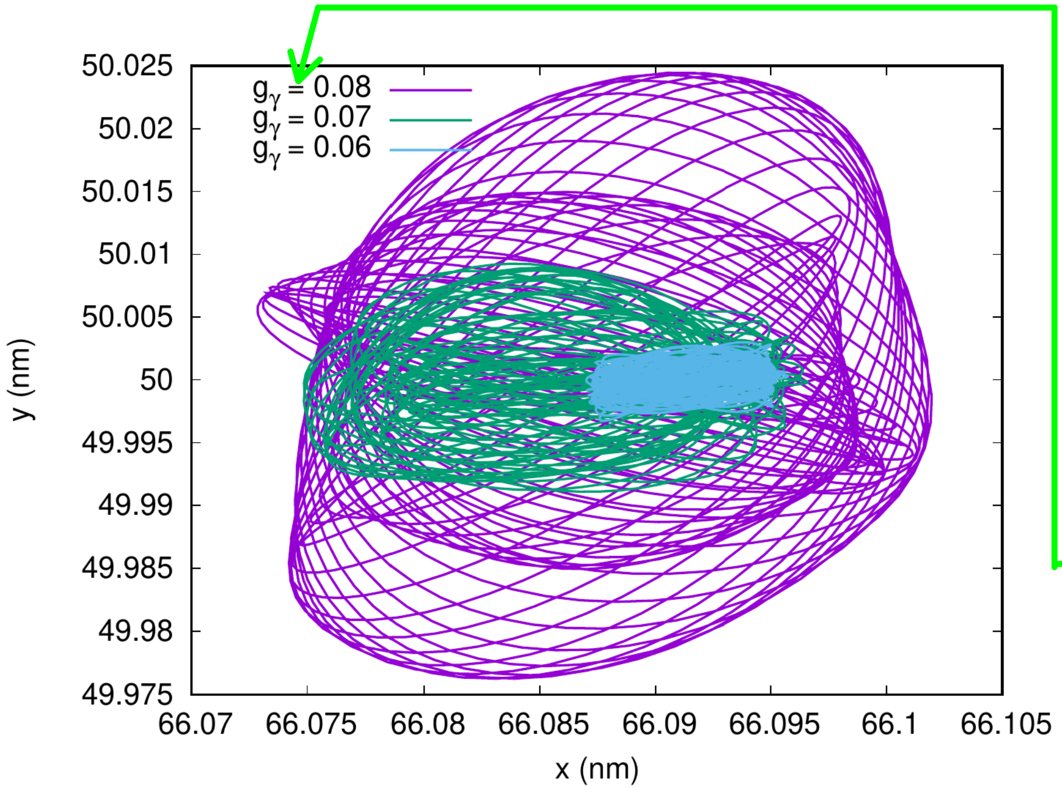
$m^* = 0{,}067\, m_e$

$K = 12.4$



$N_e = 2$, $pq = 1$

$E_\gamma = 0{,}7$ meV, $g_r = 0{,}08$



3 rafeindir í einingarlotu, $N_e = 3$

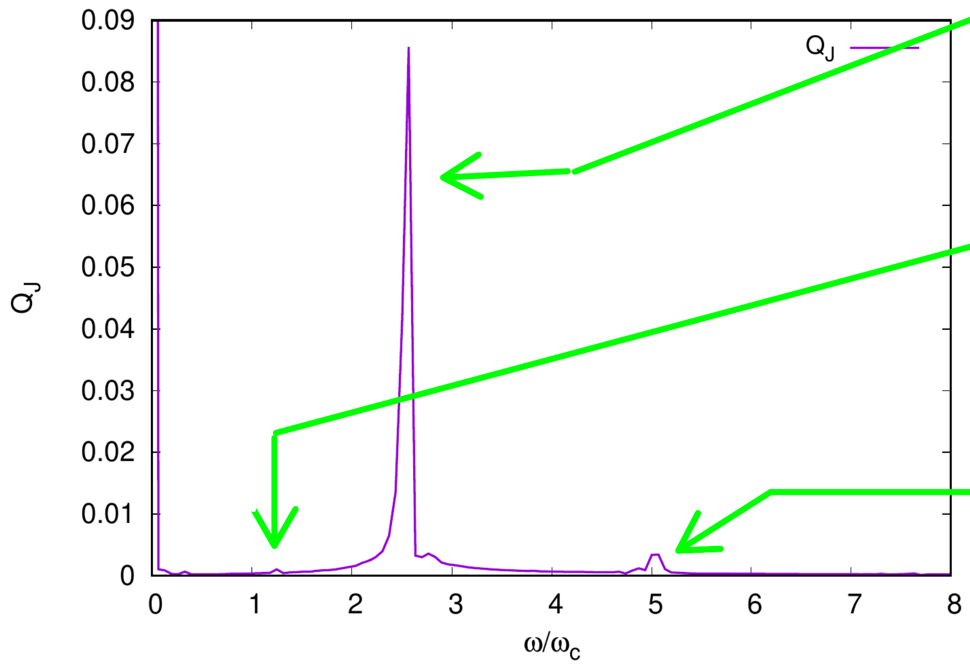
$pq = 2 \rightarrow B = 0,827$ T

$E_\gamma = 1.00$ meV (fjærinnrauð geislun)

$T = 1.0$K

$\hbar\omega_c = 1,43$ meV

víddarlaus víxlverkunarstyrkur



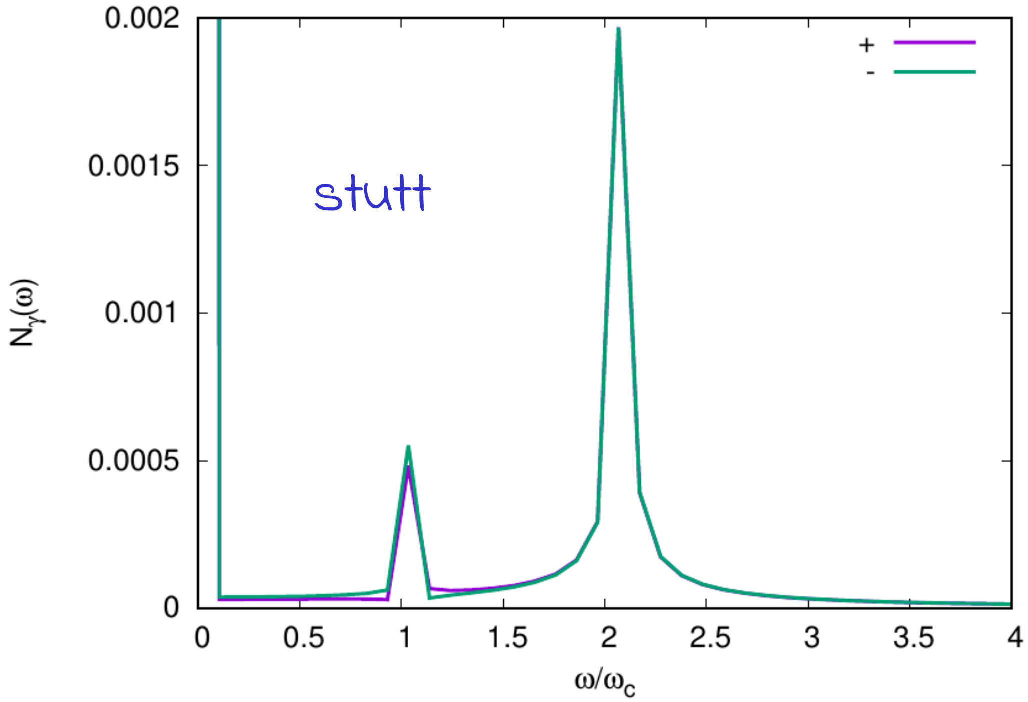
tveggja ljóseinda mótseglunar-færslur

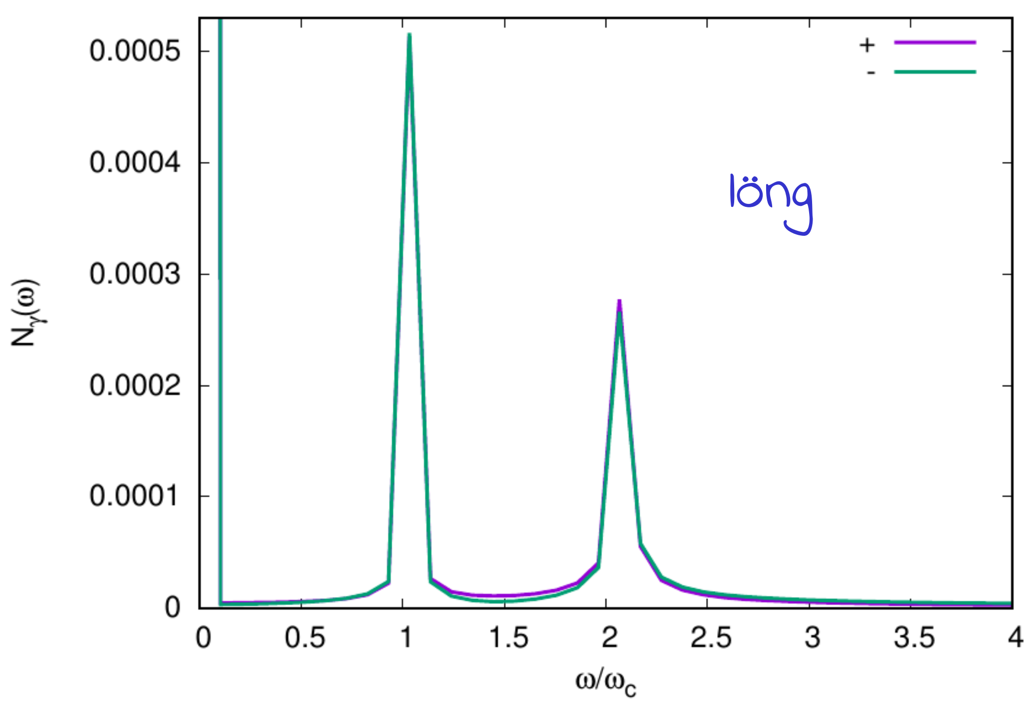
einnar ljóseindar meðseglunar-færslu hlutinn

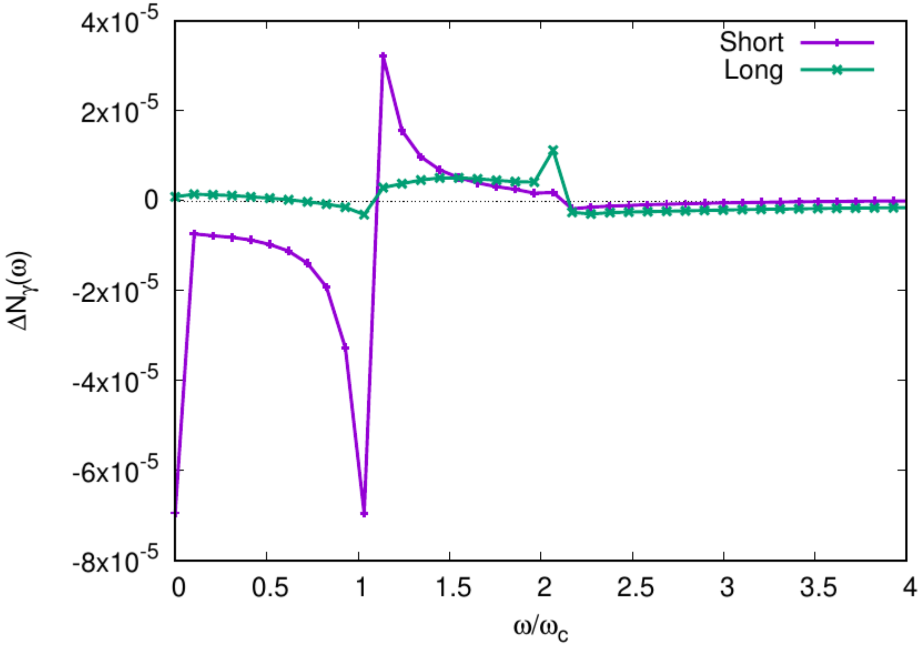
hærri mótseglunarfærslur

"löng örvun"

Samhverfubrot segulsviðs og örvunar-púls -- stuttur - langur







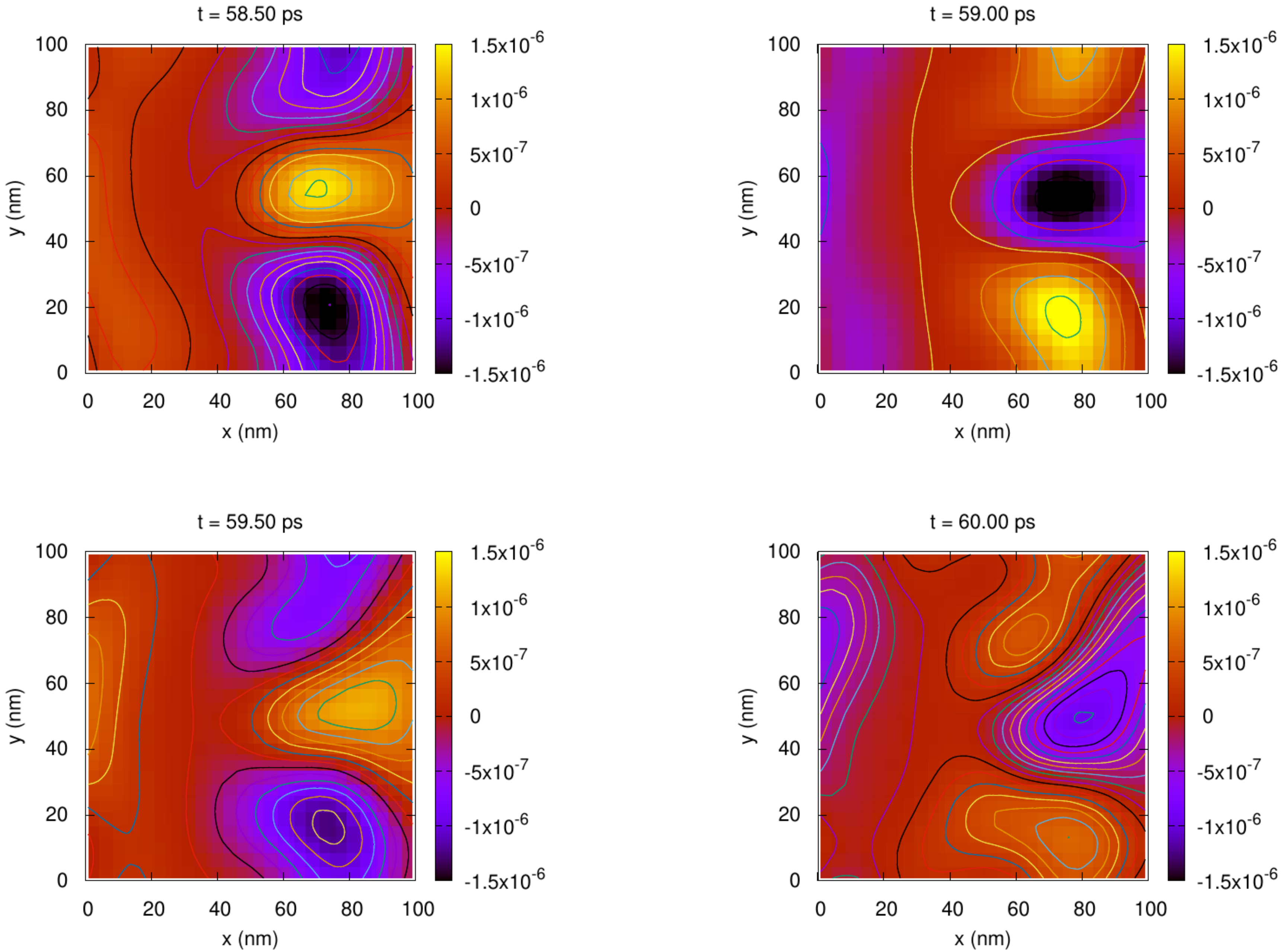
2 rafeindir, $pq = 1$

$E_\gamma = 0.70$ meV, $g_\gamma = 0.04$, veik örvun

Stutt örvun með mismunandi formerki hefur áhrif á meðseglunarfærslur

Löng örvun dregur úr mótseglunarfærslum óháð formerki

0-skautssveifluhættir -- "öndunarsveiflur" -- snúningur



3 rafeindir, pq = 2, þéttleikabreytingar, E_γ = 1.00 meV, g_γ = 0.08

Signatures of broken symmetries in the excitations of a periodic 2DEG coupled to a cylindrical photon cavity

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The use of high frequency microwaves in absolute palaeomagnetic intensity experiments

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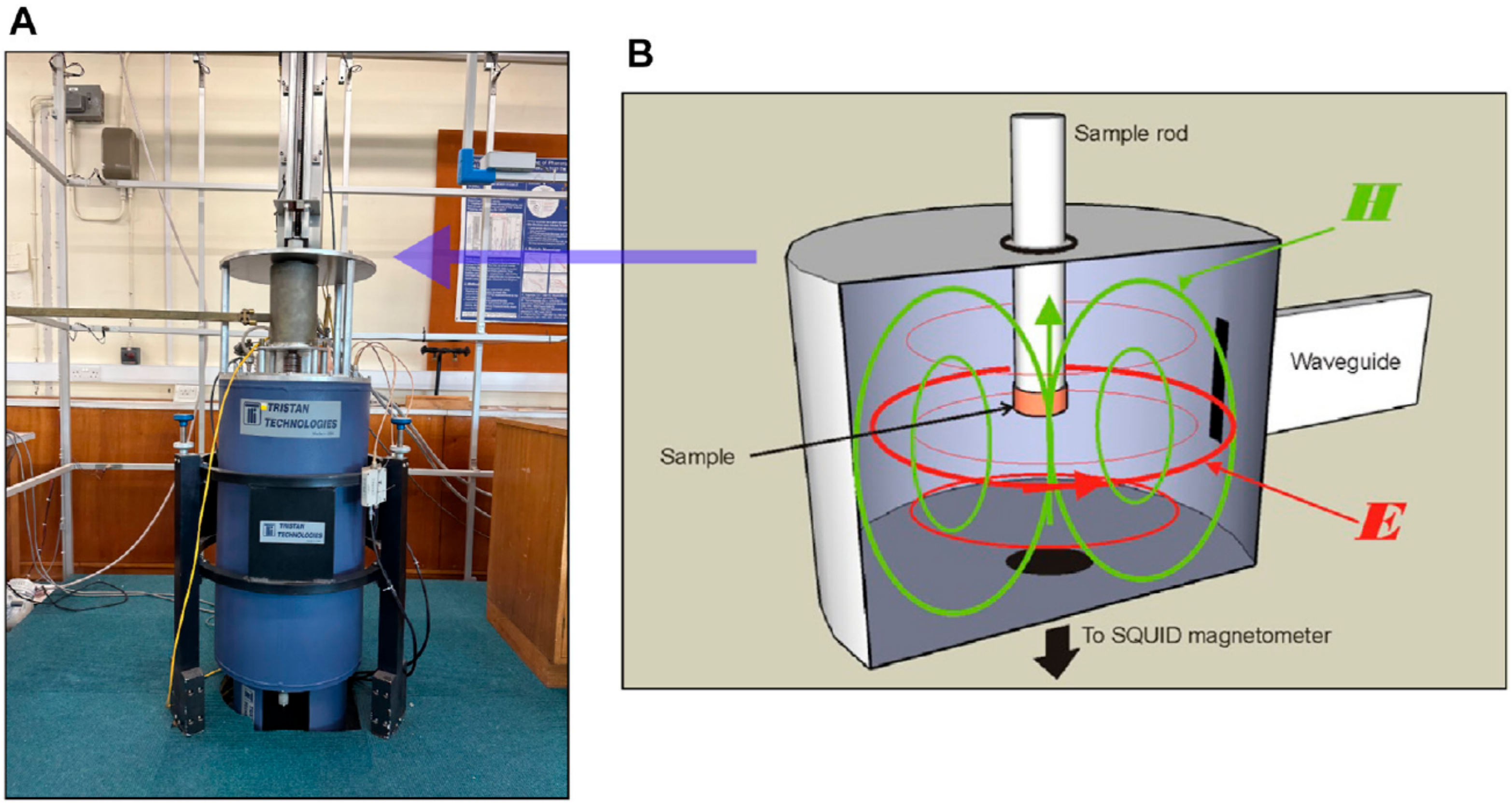

FIGURE 2
(A) Image of the microwave system. **(B)** Microwave cavity cross section showing the electric and magnetic fields in TE011 mode, waveguide slot, sample/holder position and magnetometer direction, adapted from AGU poster; Shaw et al., 1996.