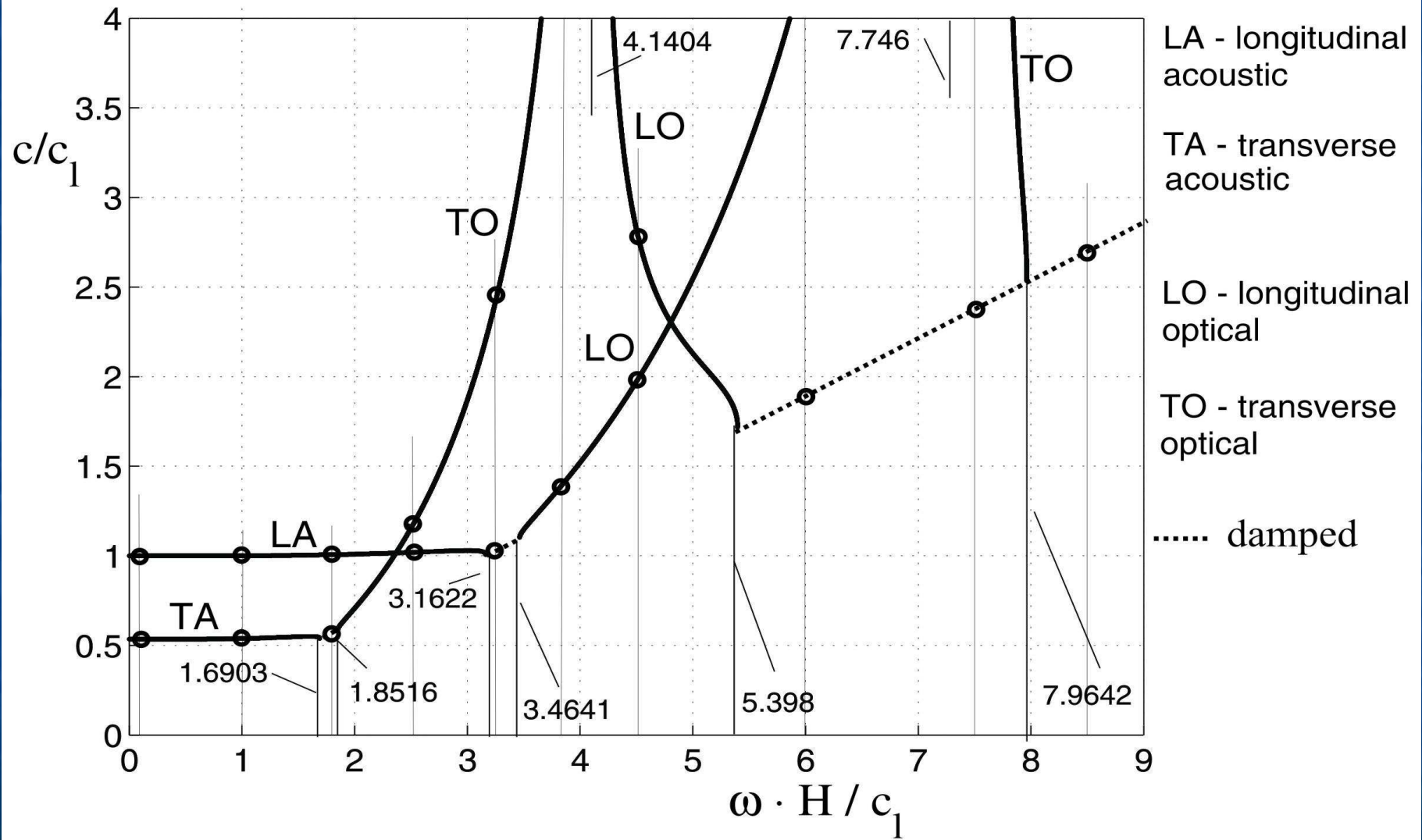
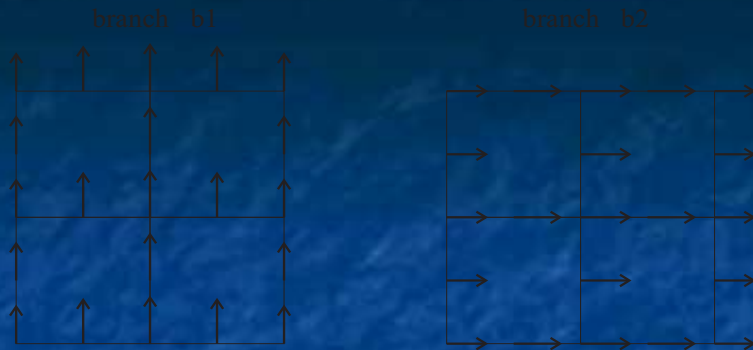


Numerické experimenty

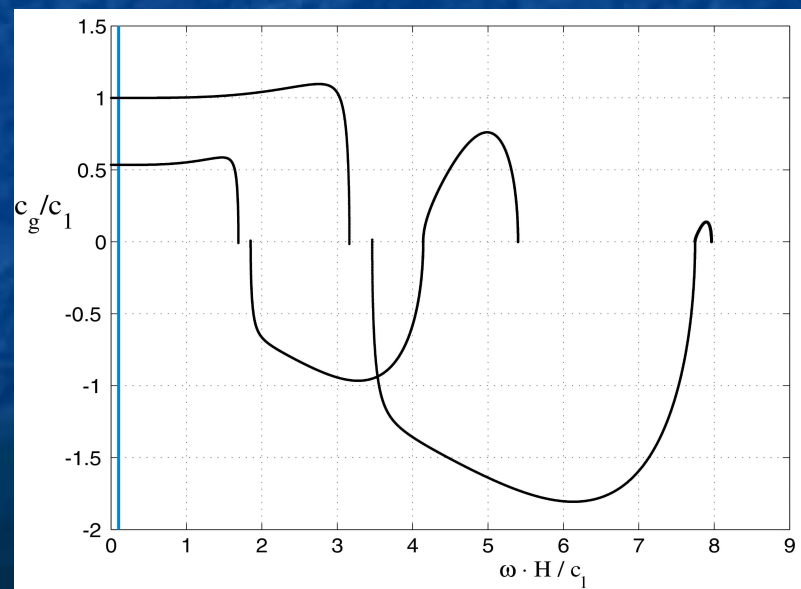
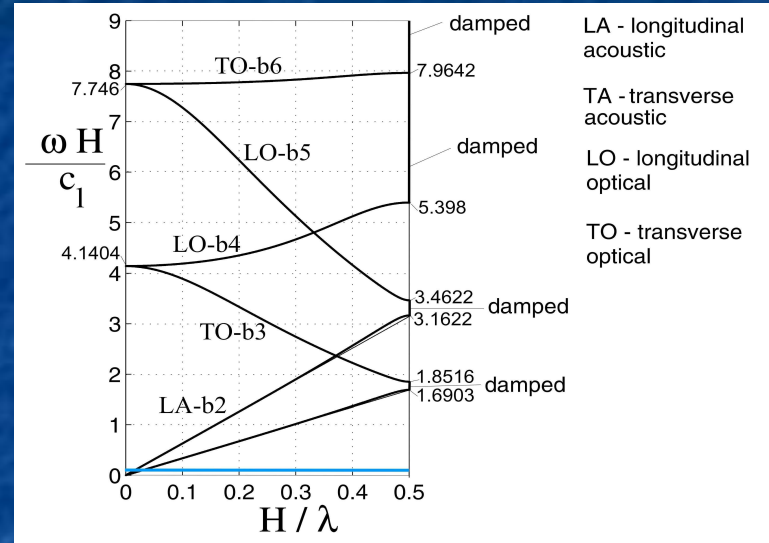
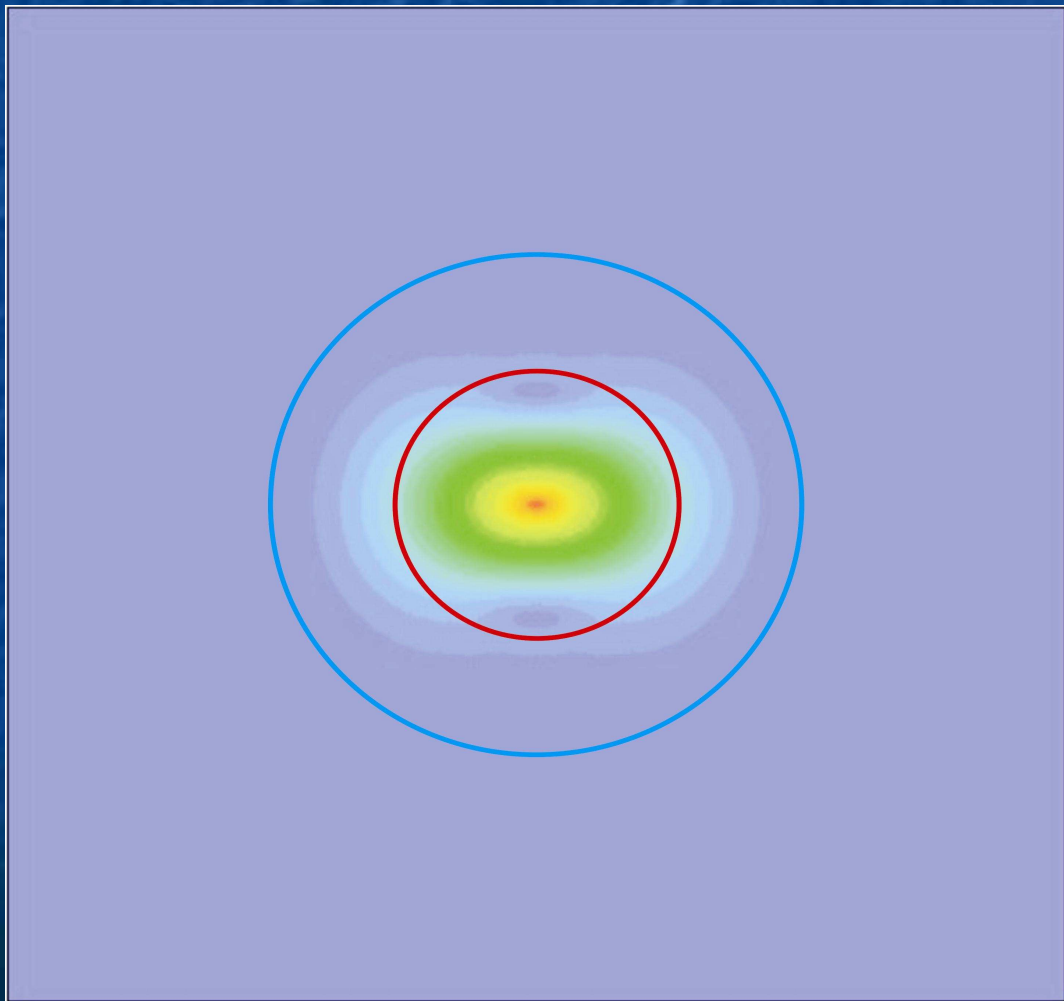
1. Rozlehlá stěna ve stavu rovinné deformace,
sít' 100x100 kvadratických prvků,
velikost hrany prvku $H=1\text{mm}$
2. Bodové kinematické buzení ve středu desky
ve vodorovném směru,
pro jednotlivé testy se bezrozměrná frekvence $\omega H/c_1$
mění v rozmezí 0.1-8.3 s krokem 0.1
3. Numerická integrace Newmarkovou metodou
s časovým krokem $\Delta t=1\text{e-}5\text{ s}$,
Courantovo číslo $Co=c_1\Delta t/H=0.011602$
4. Materiálové vlastnosti: modul pružnosti $E=1\text{ Pa}$
Poissonovo číslo $\mu=0.3$
hustota $\rho=1\text{ kg/m}^3$

Frekvence buzení



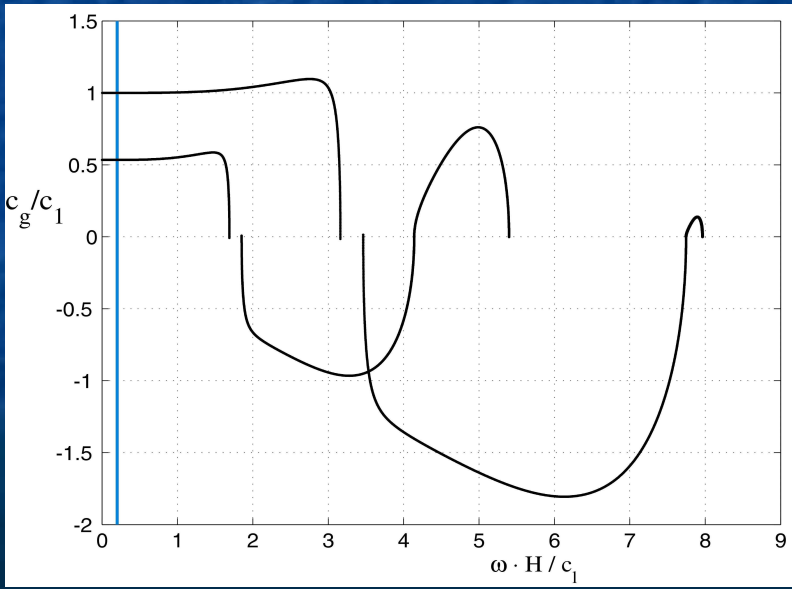
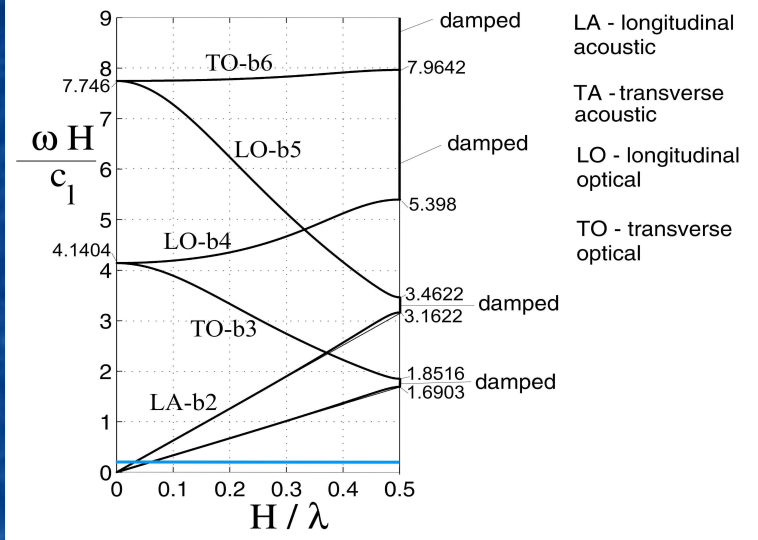
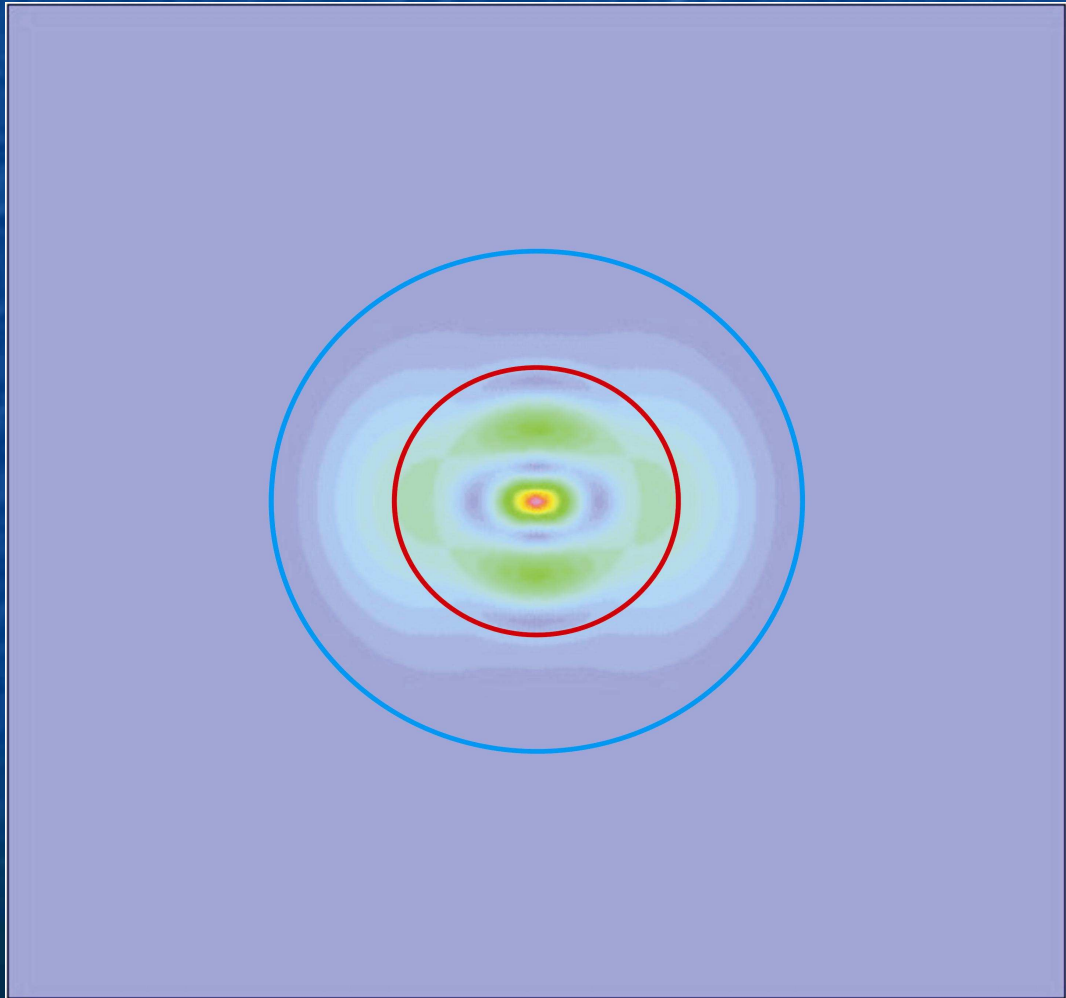


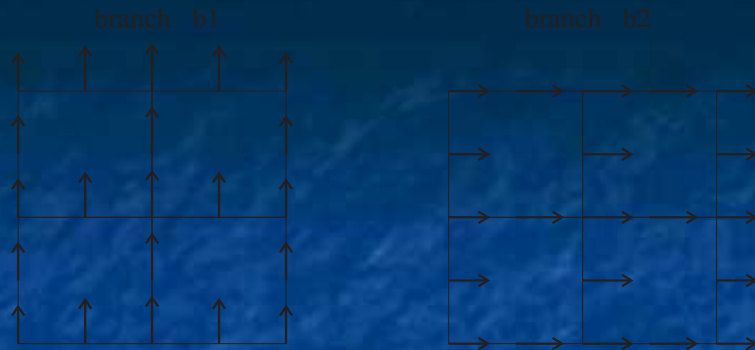
$$\omega H / c_1 = 0.1$$



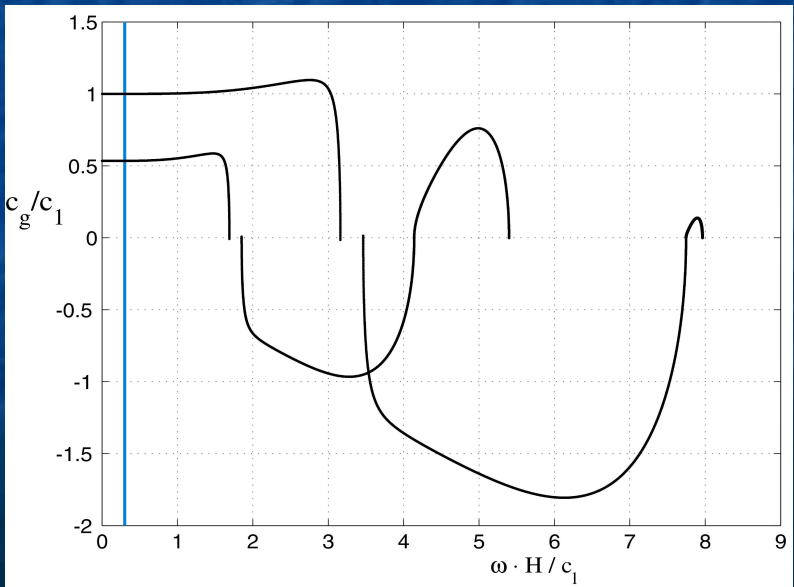
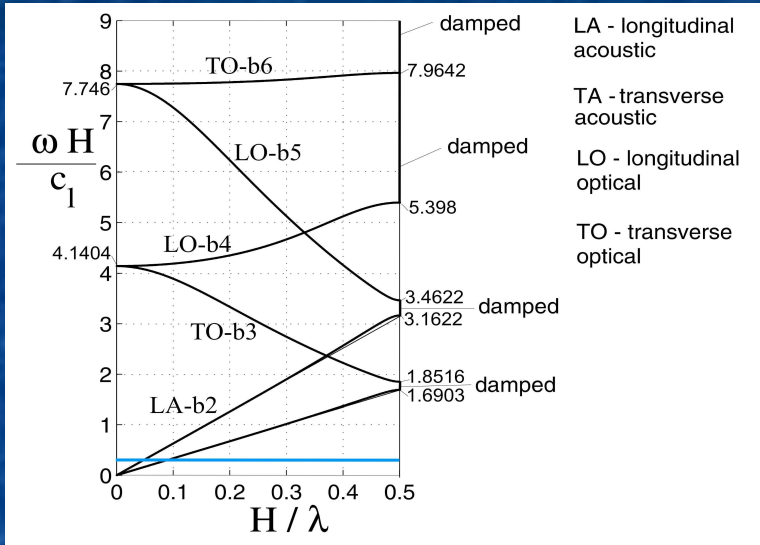
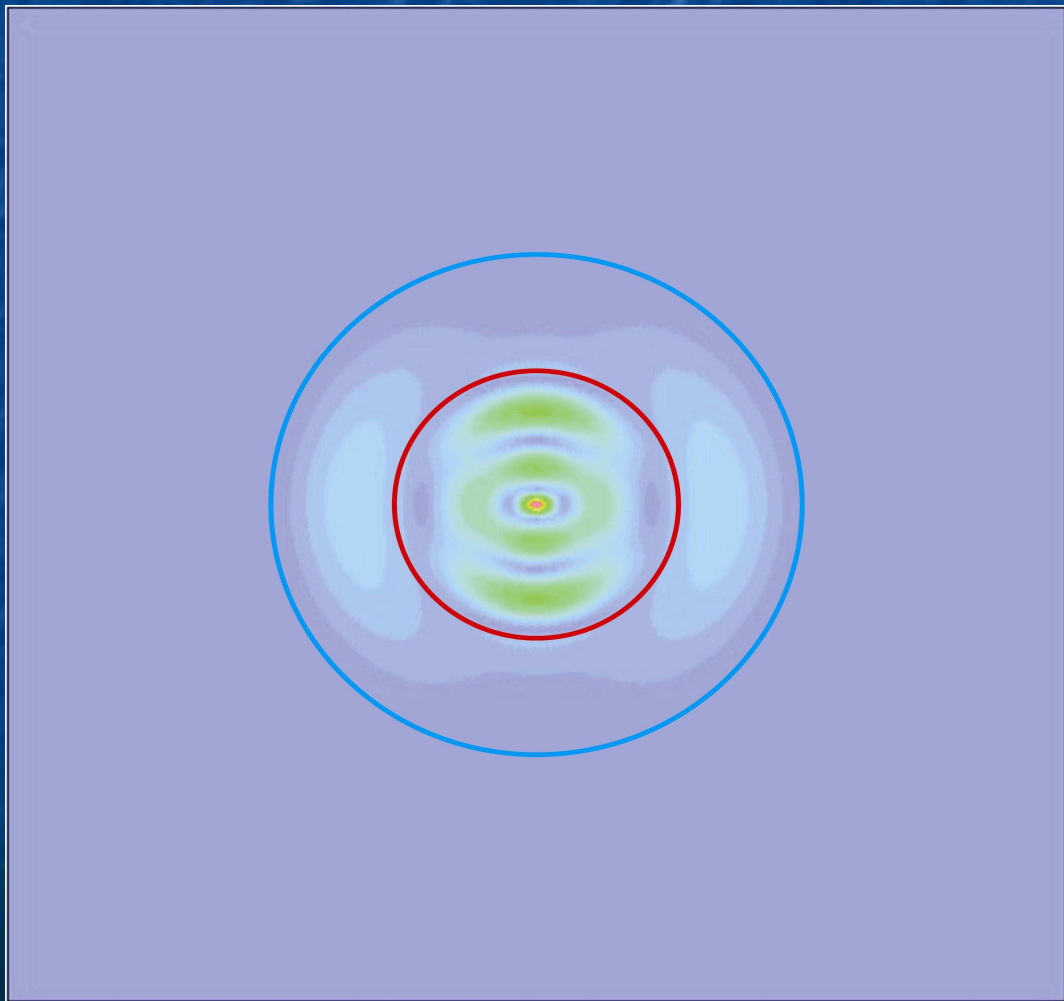


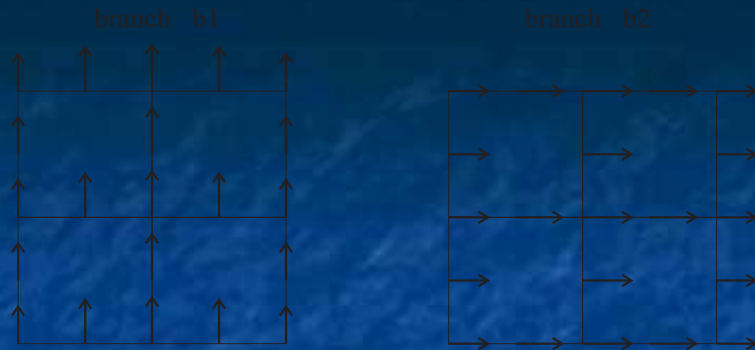
$$\omega H / c_1 = 0.2$$



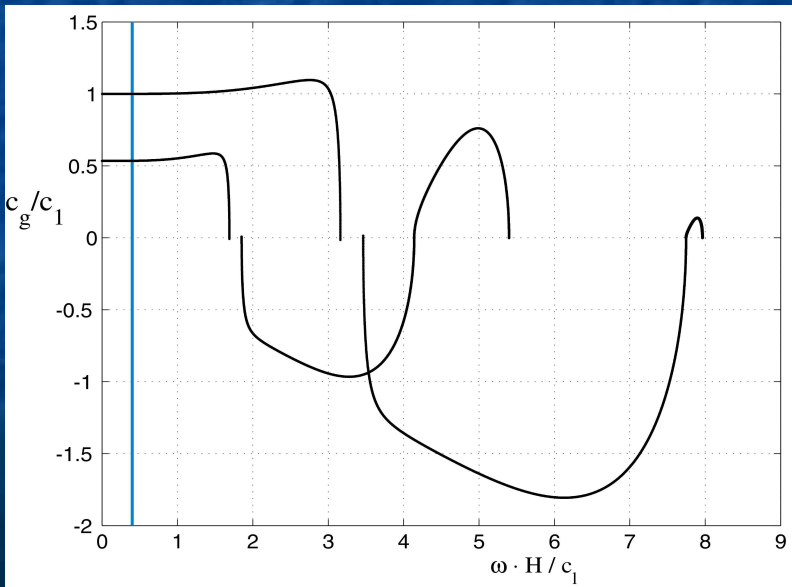
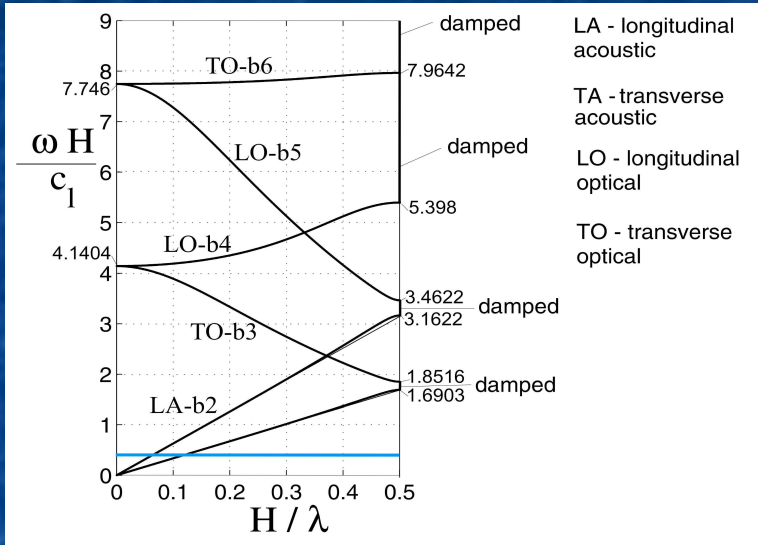
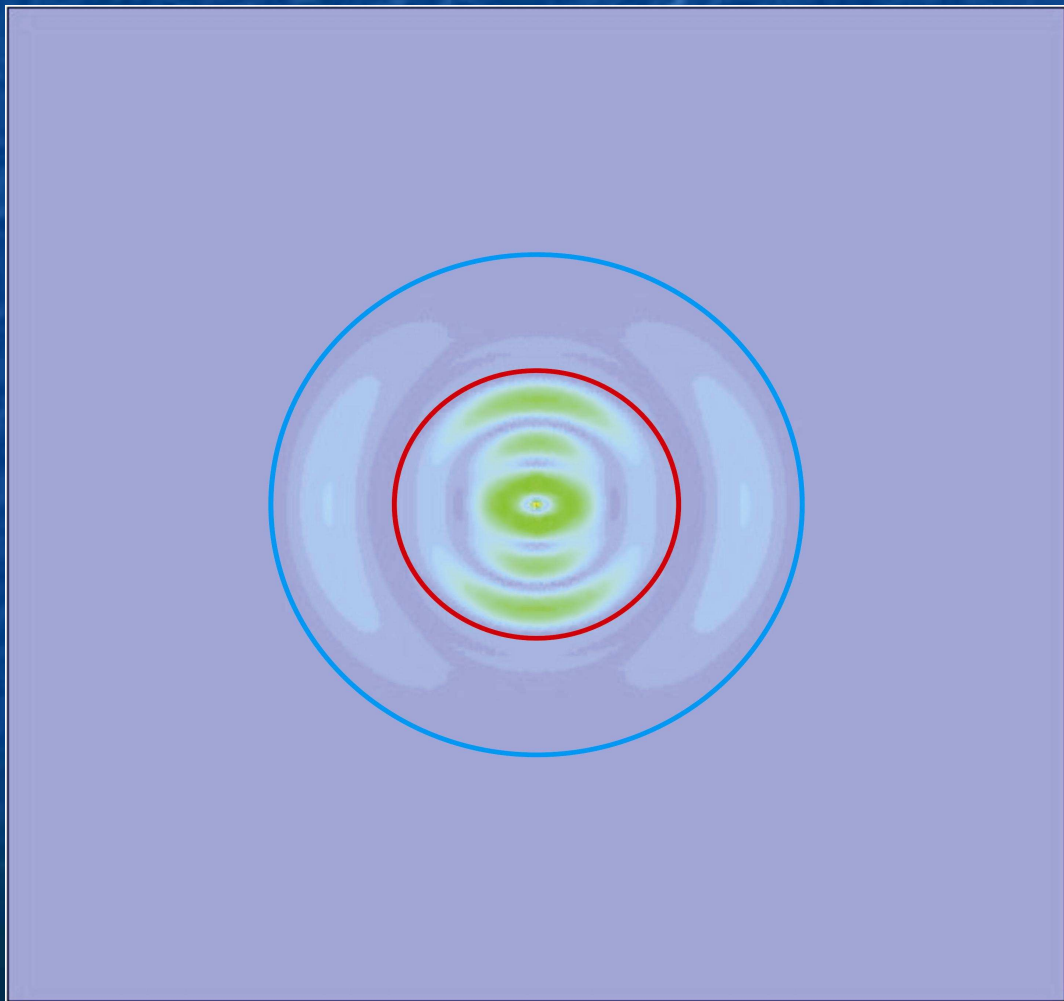


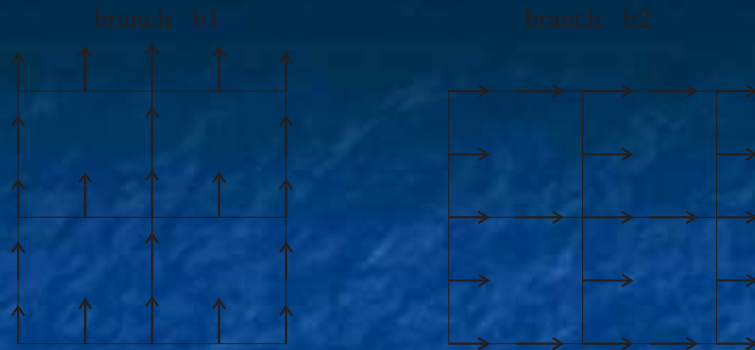
$$\omega H / c_1 = 0.3$$



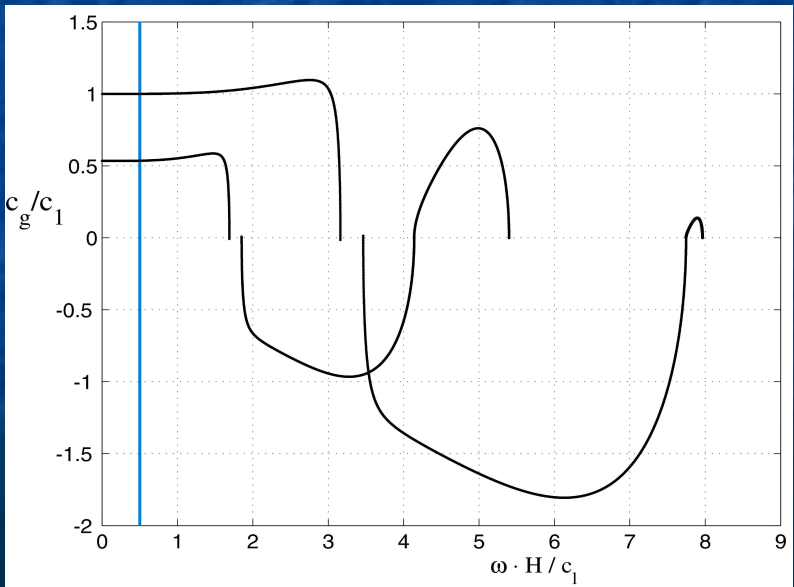
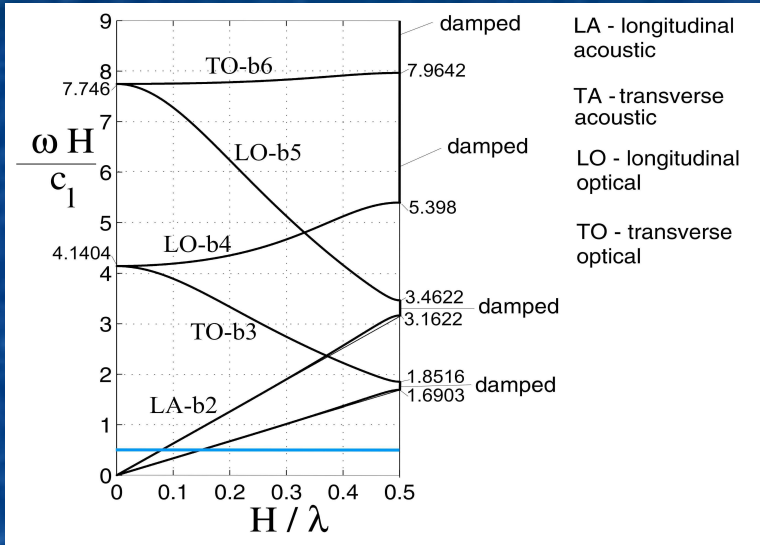
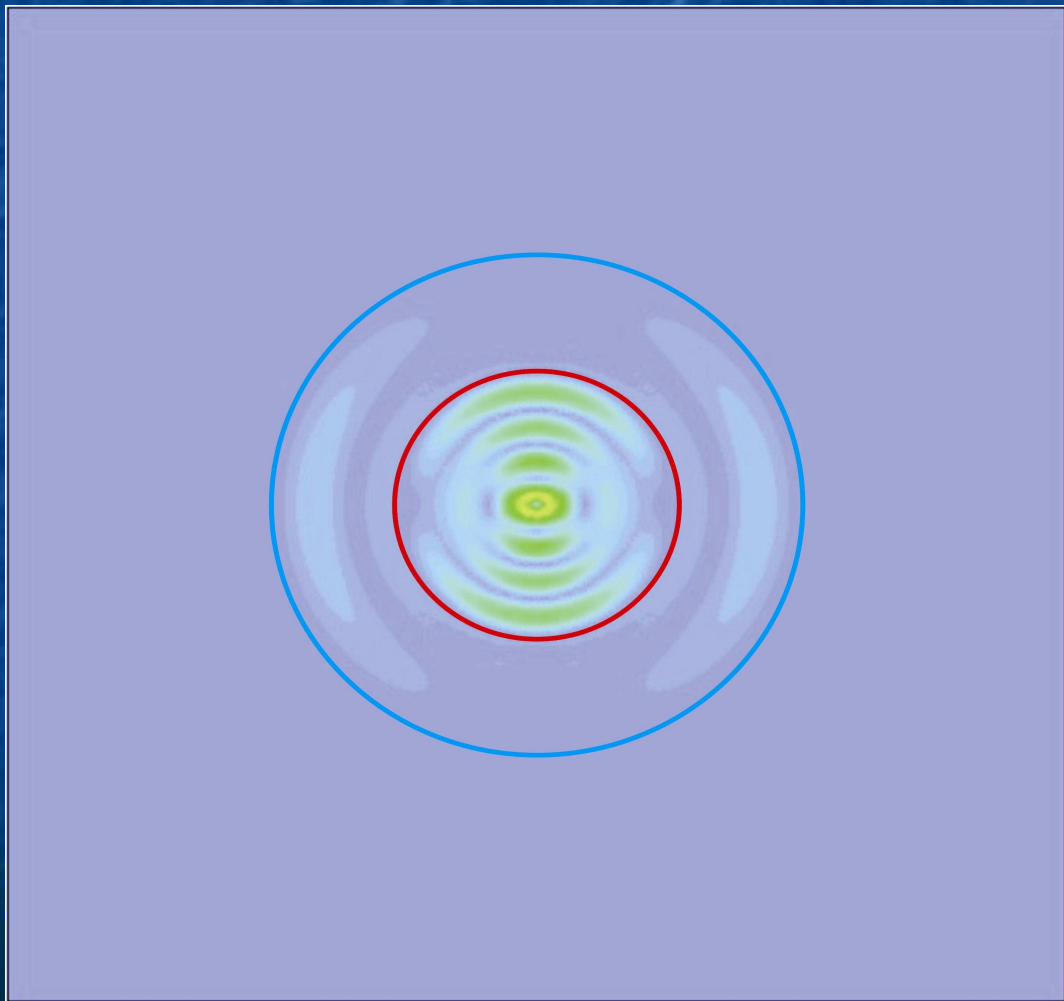


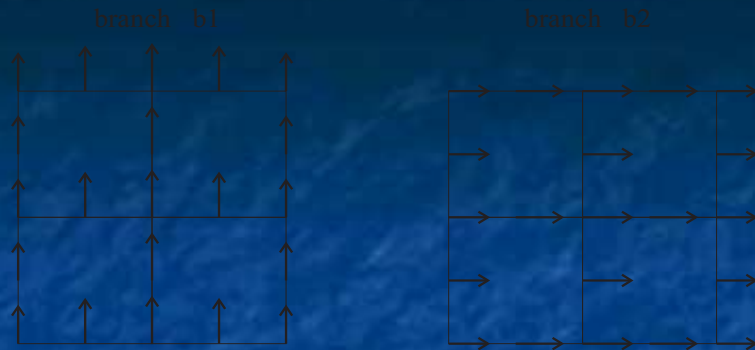
$$\omega H / c_1 = 0.4$$



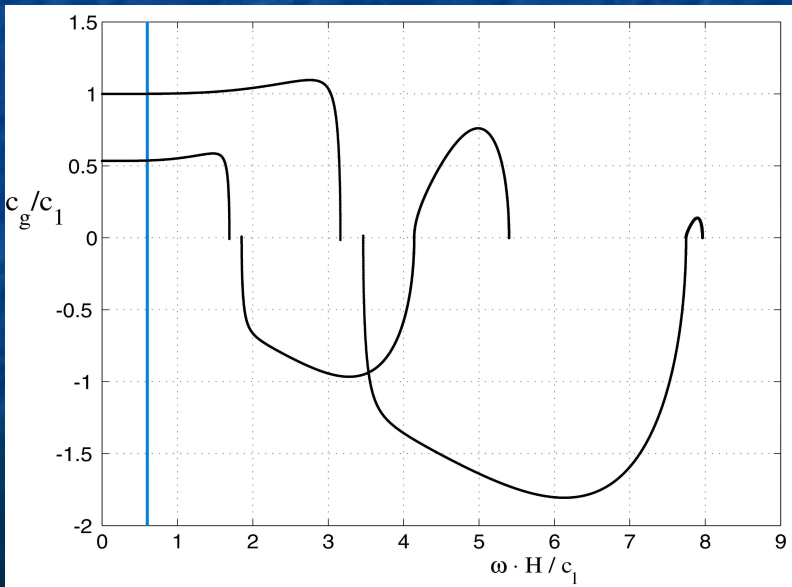
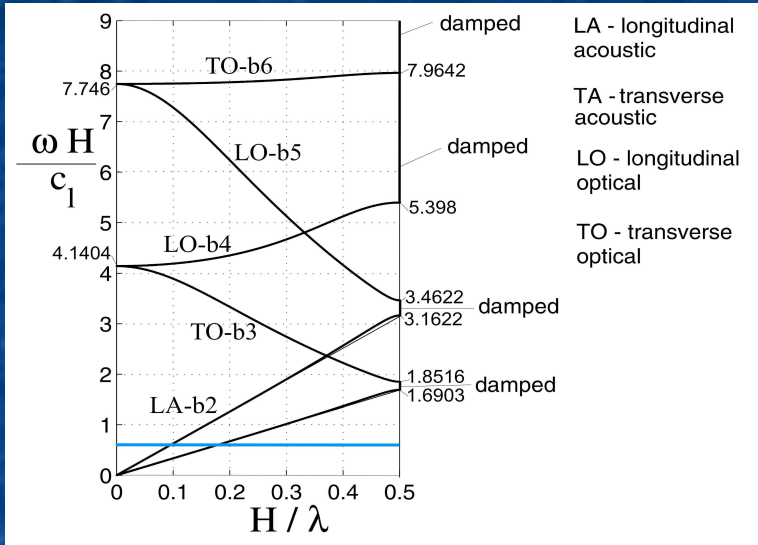
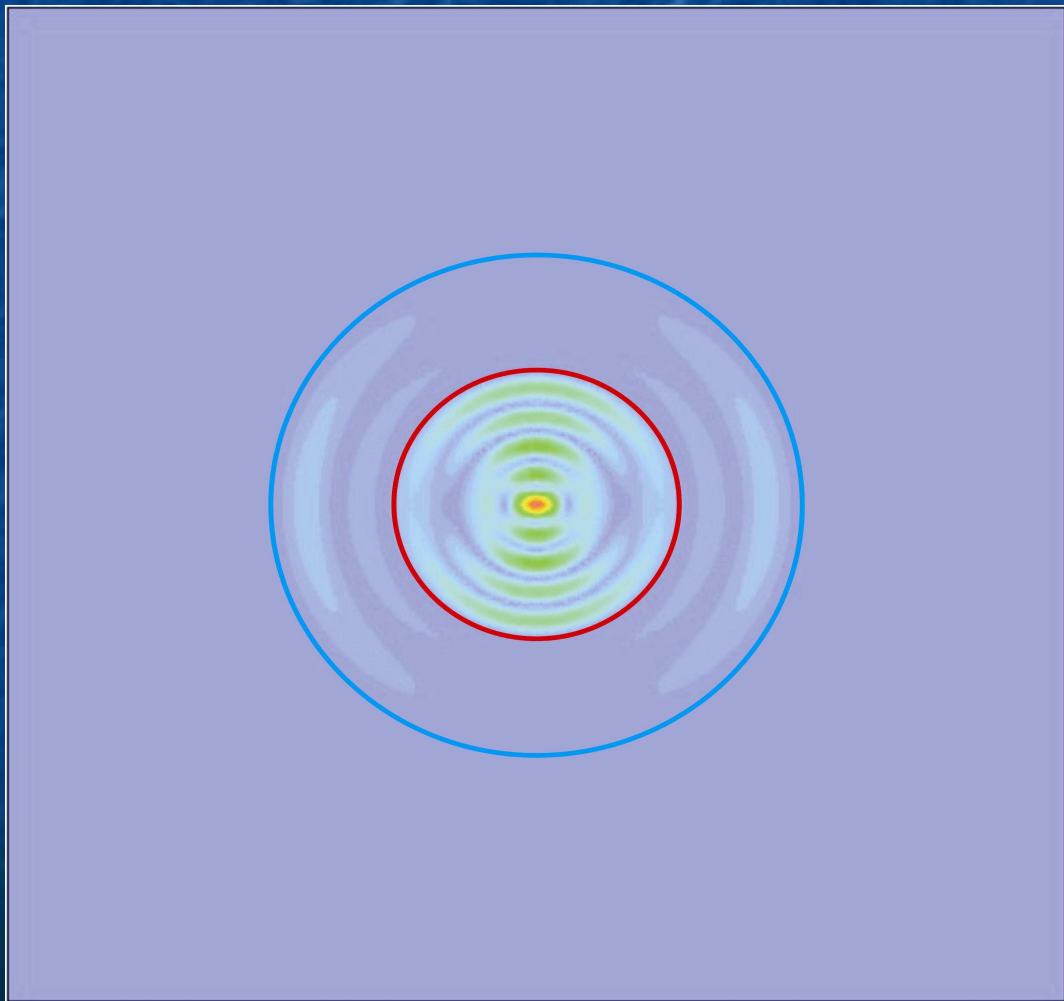


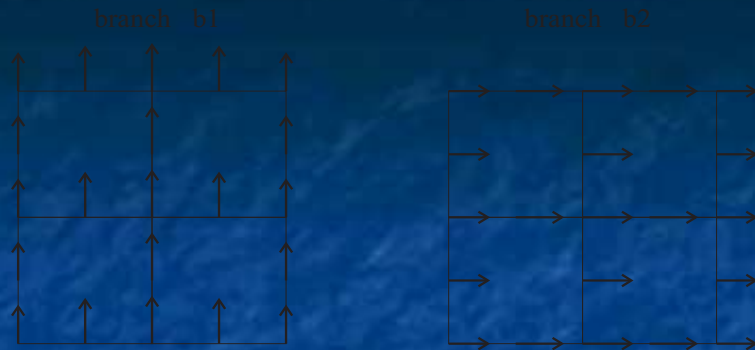
$$\omega H / c_1 = 0.5$$



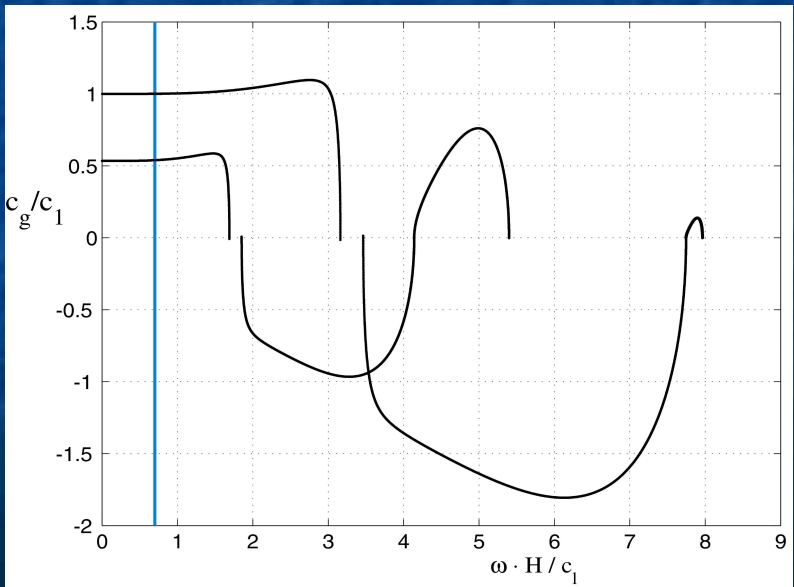
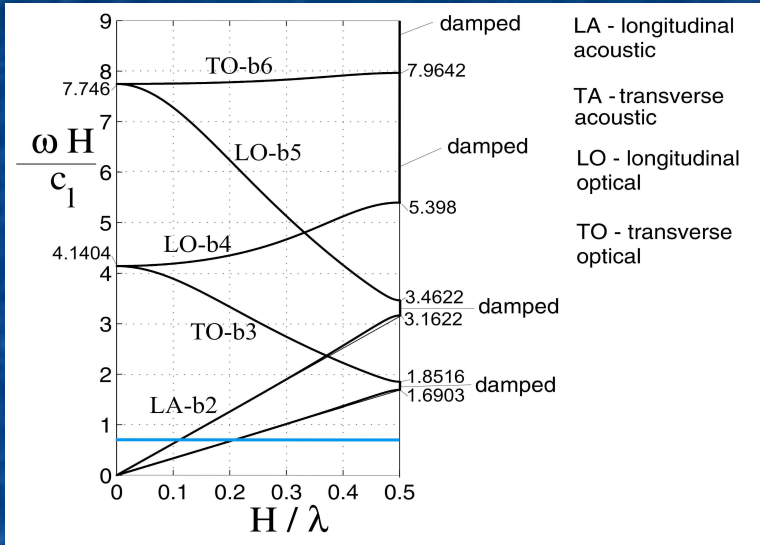
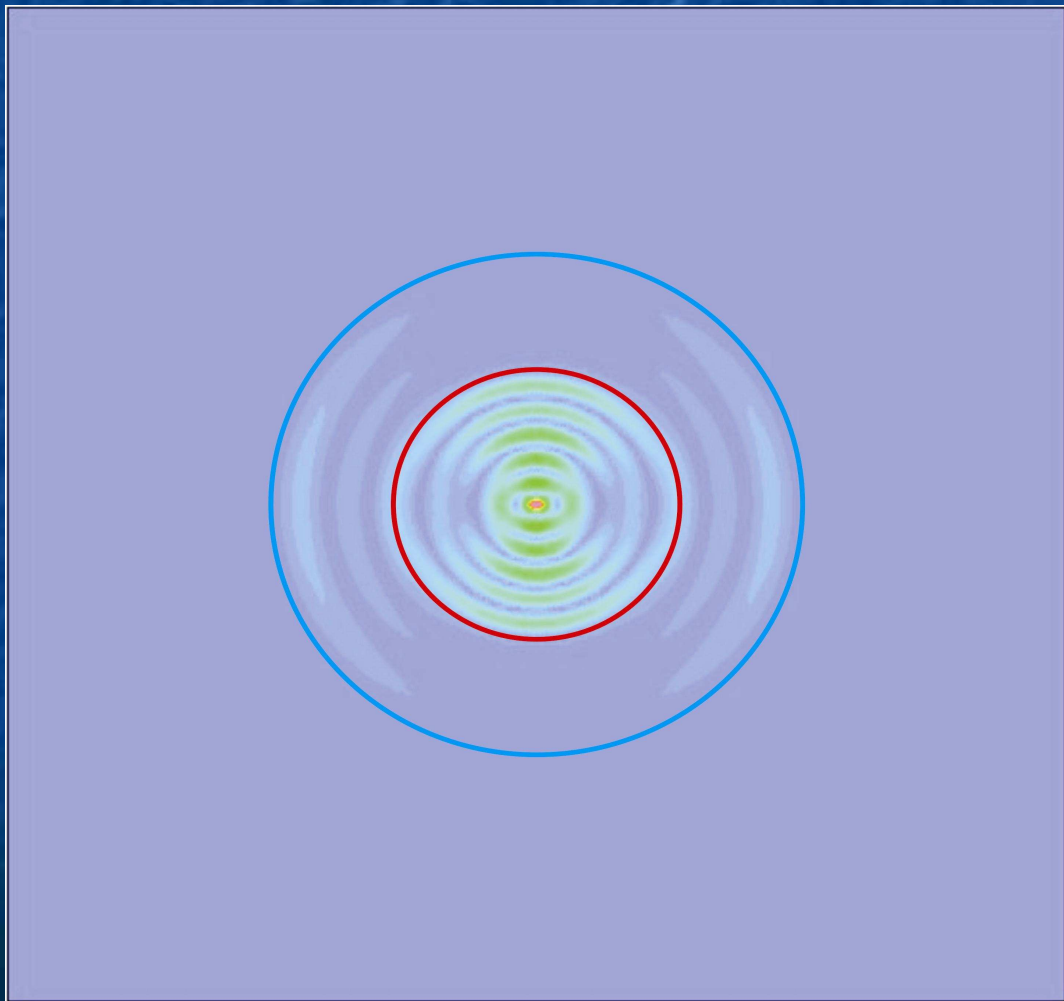


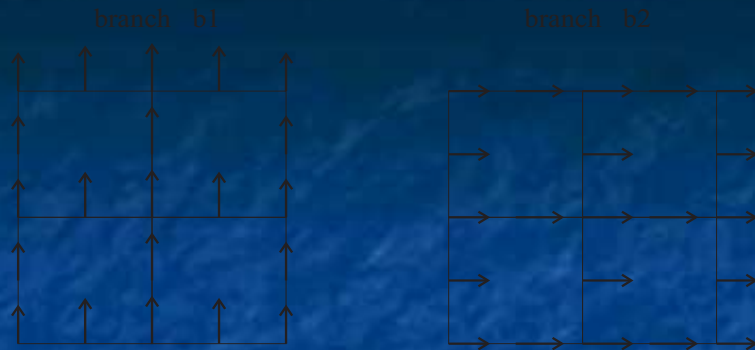
$$\omega H / c_1 = 0.6$$



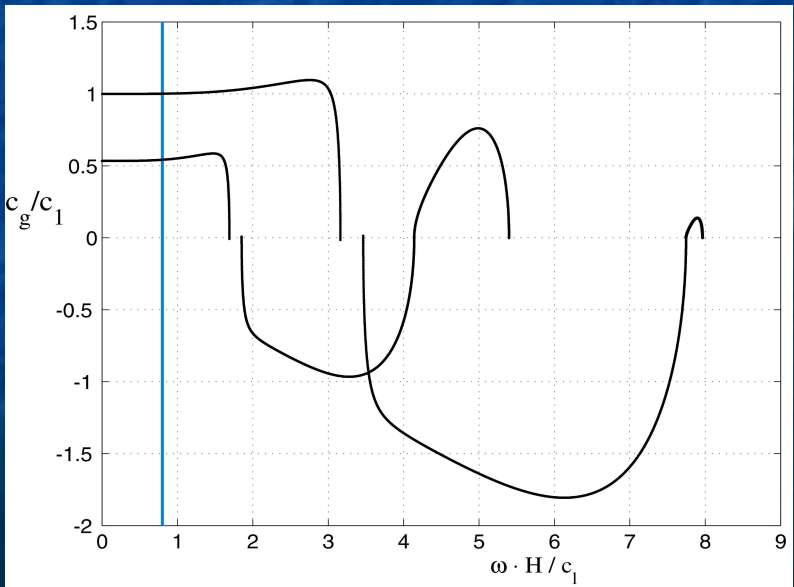
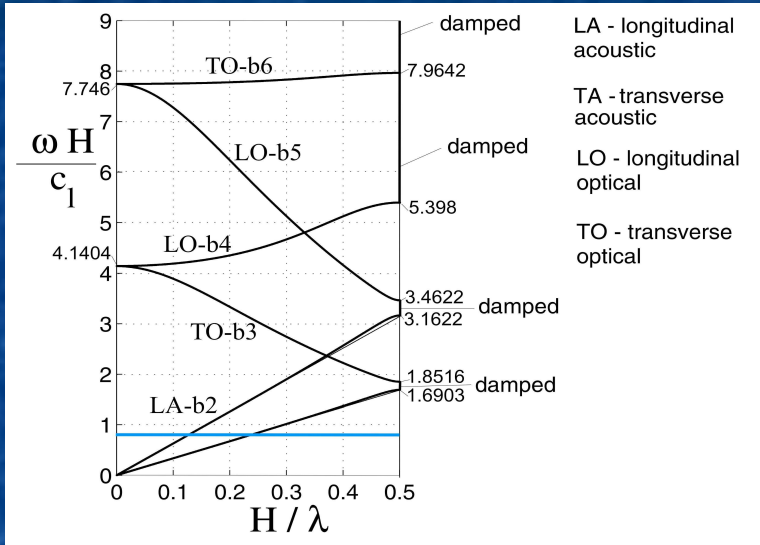
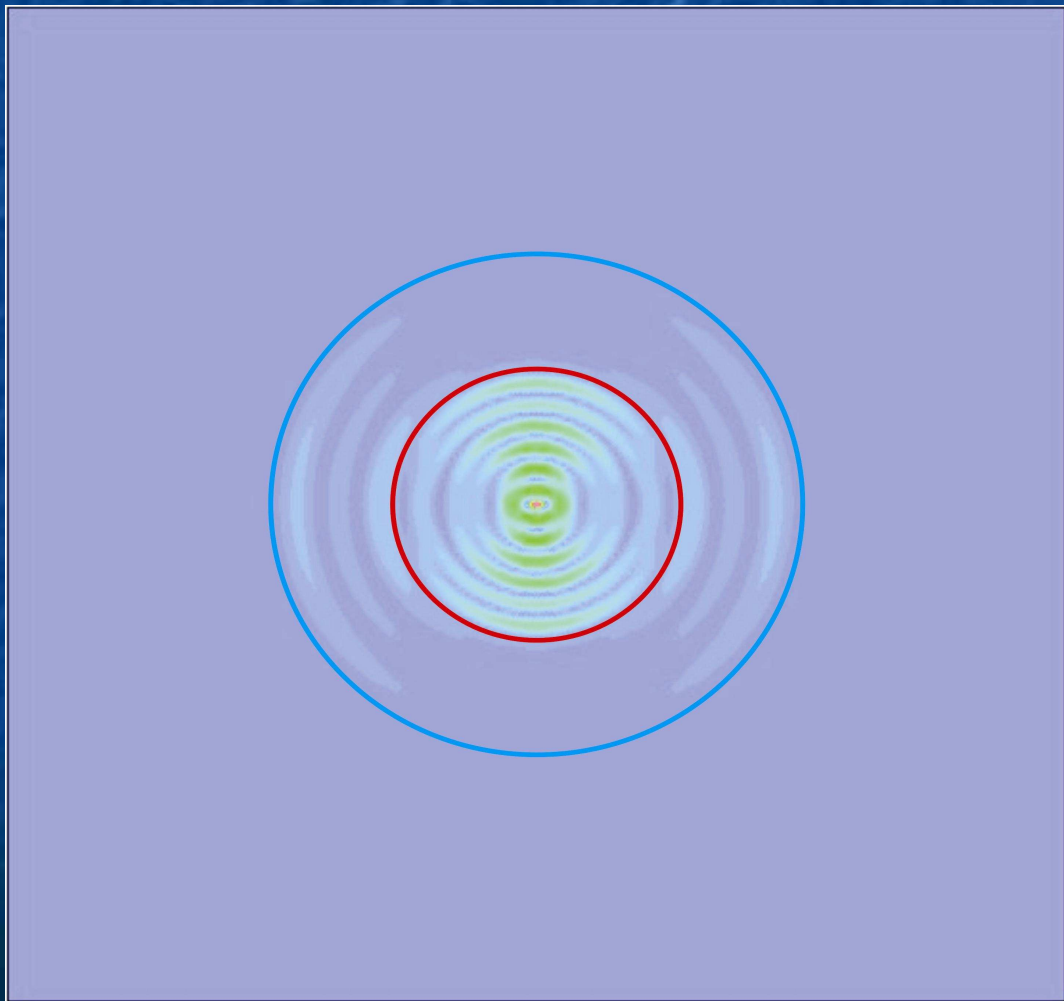


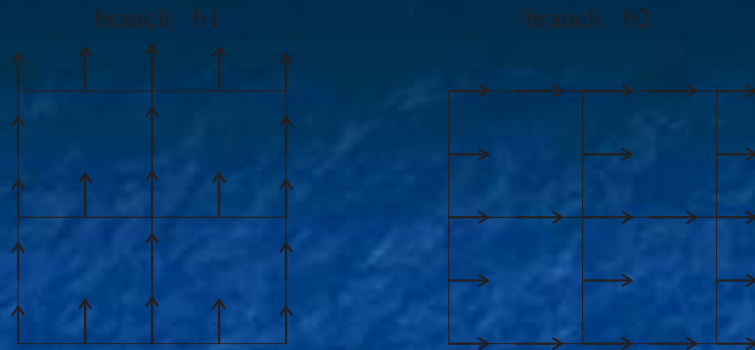
$$\omega H / c_1 = 0.7$$



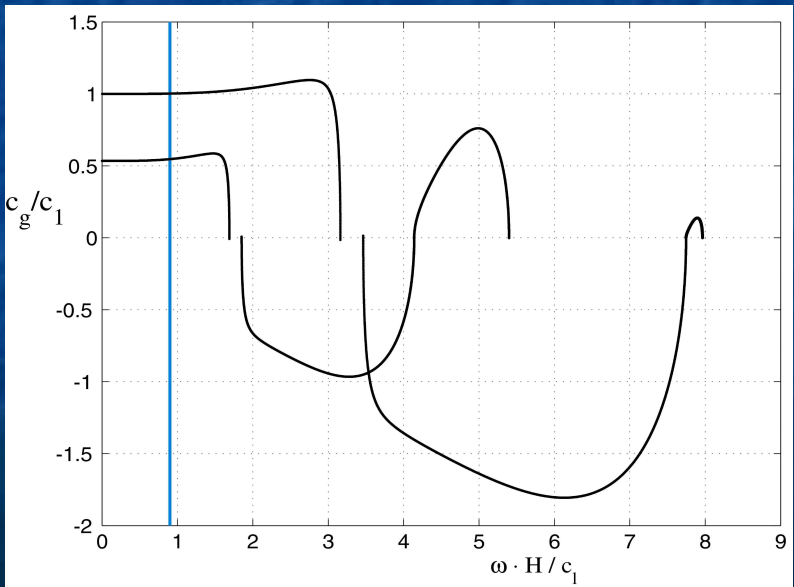
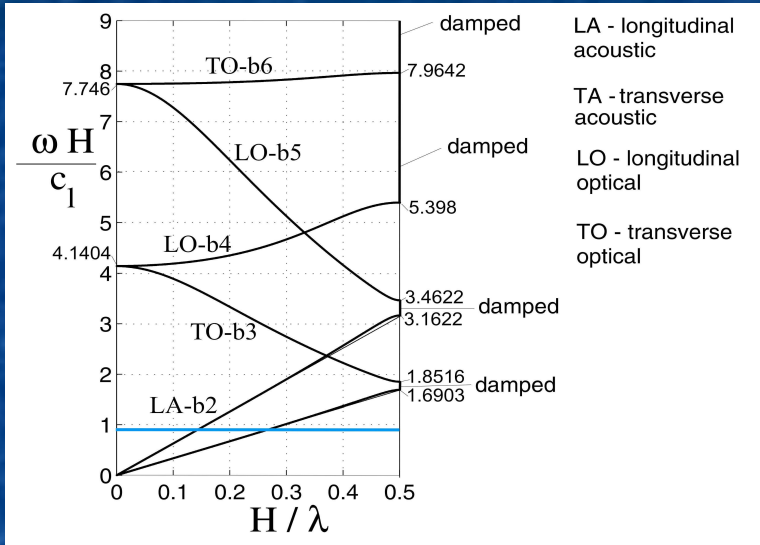
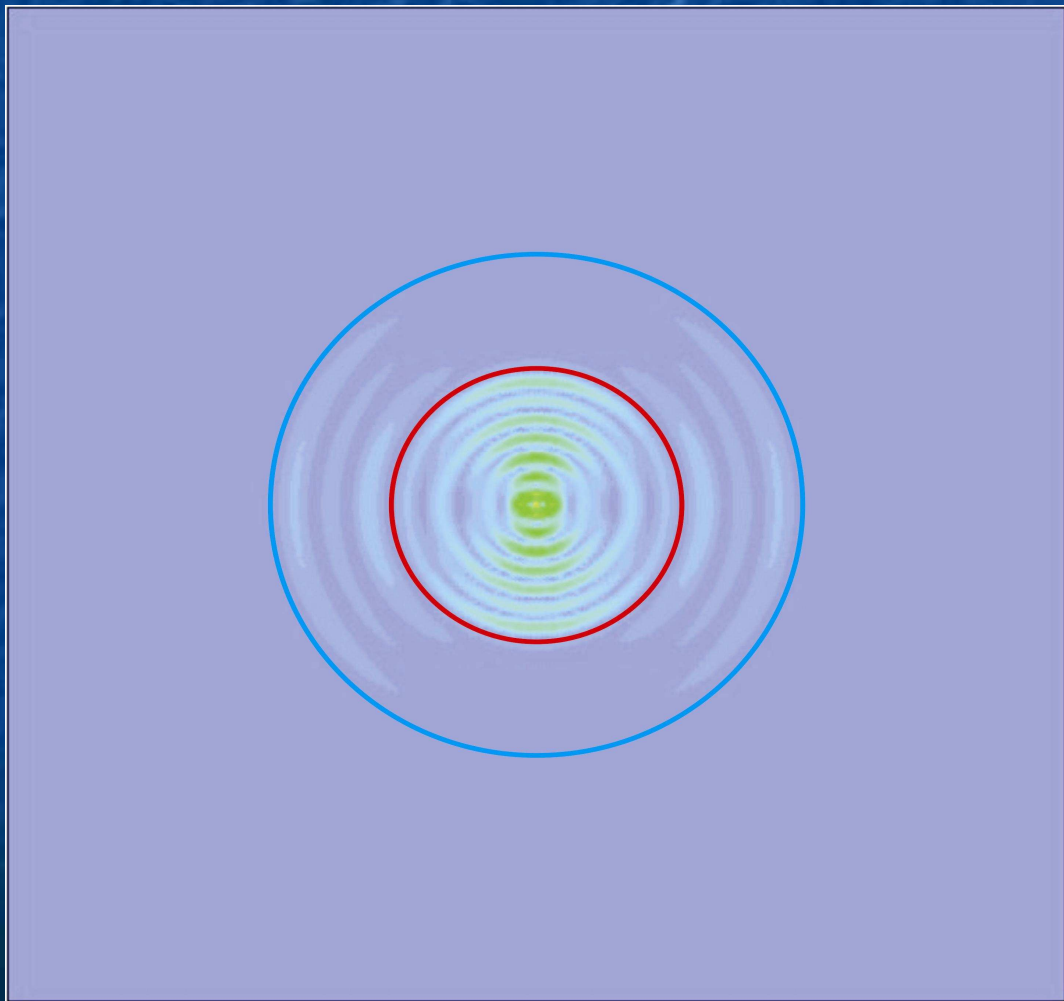


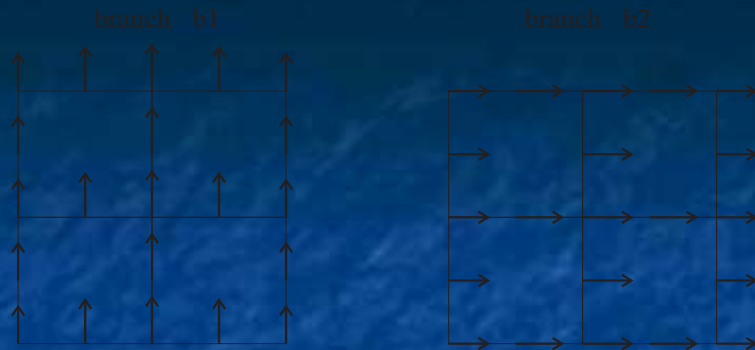
$$\omega H / c_1 = 0.8$$



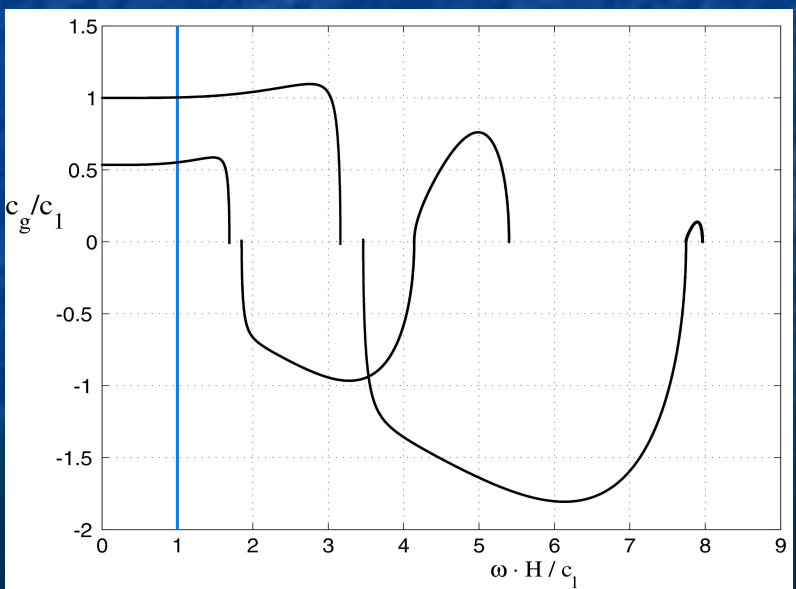
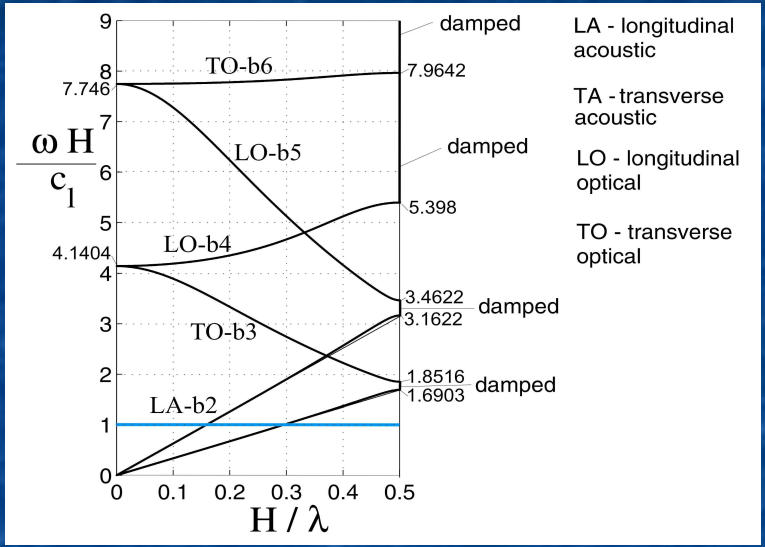
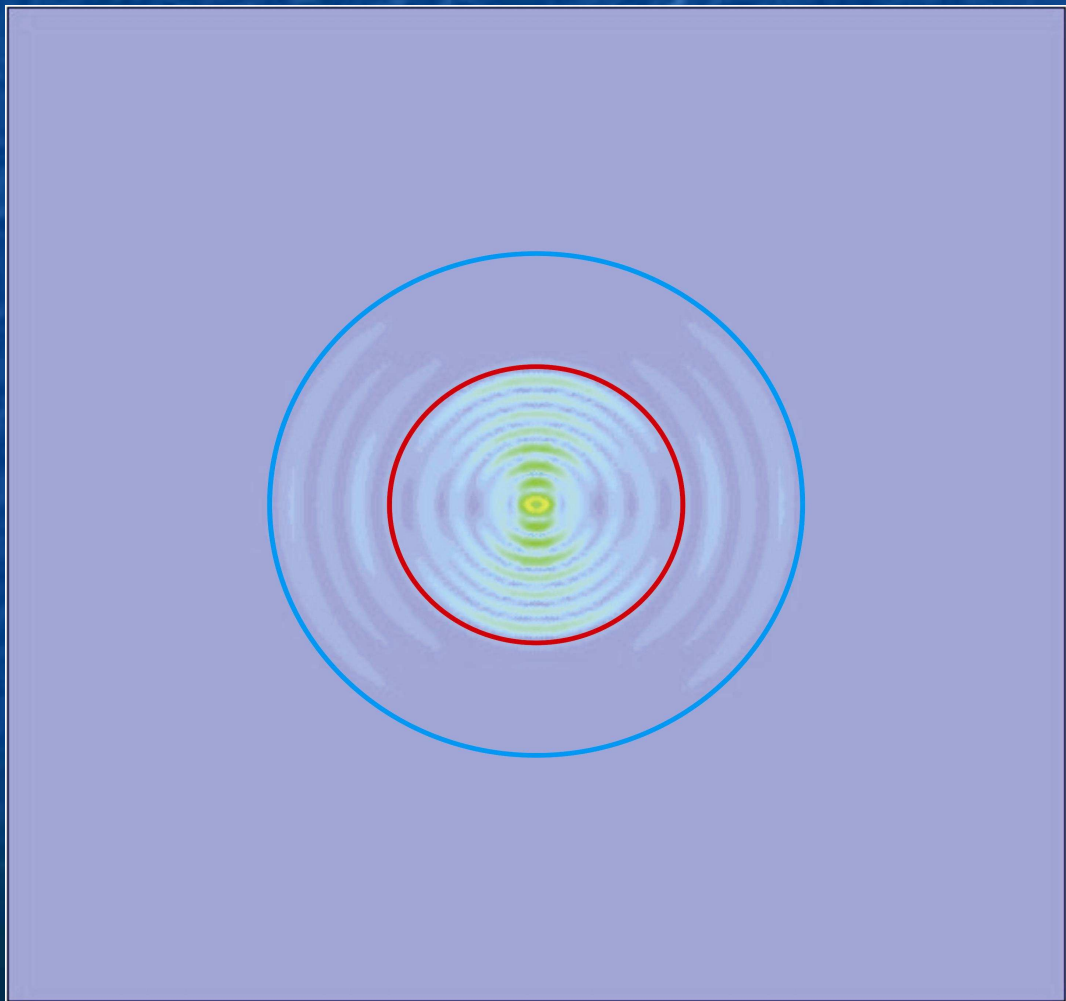


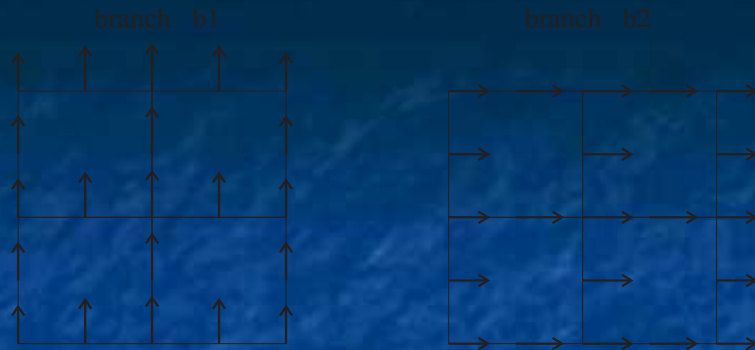
$$\omega H / c_1 = 0.9$$



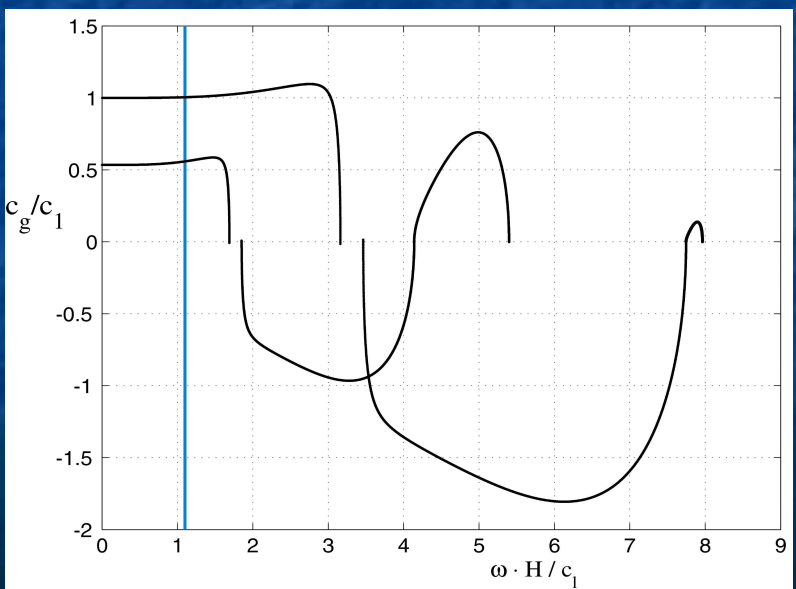
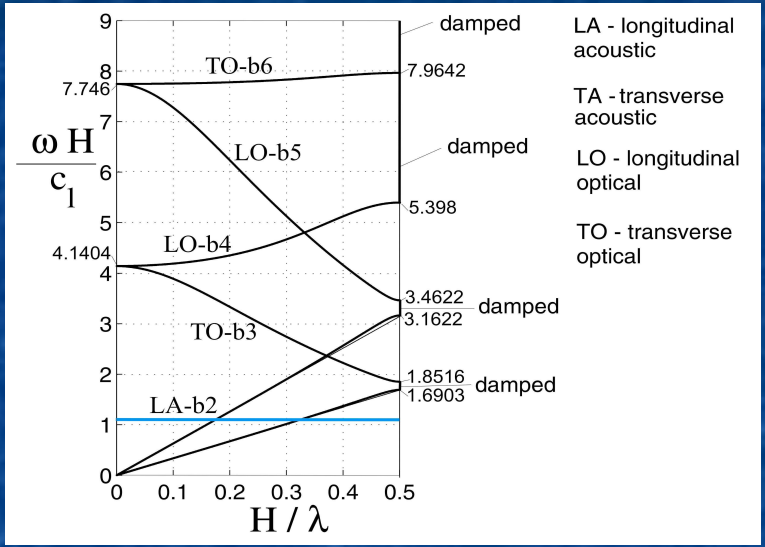
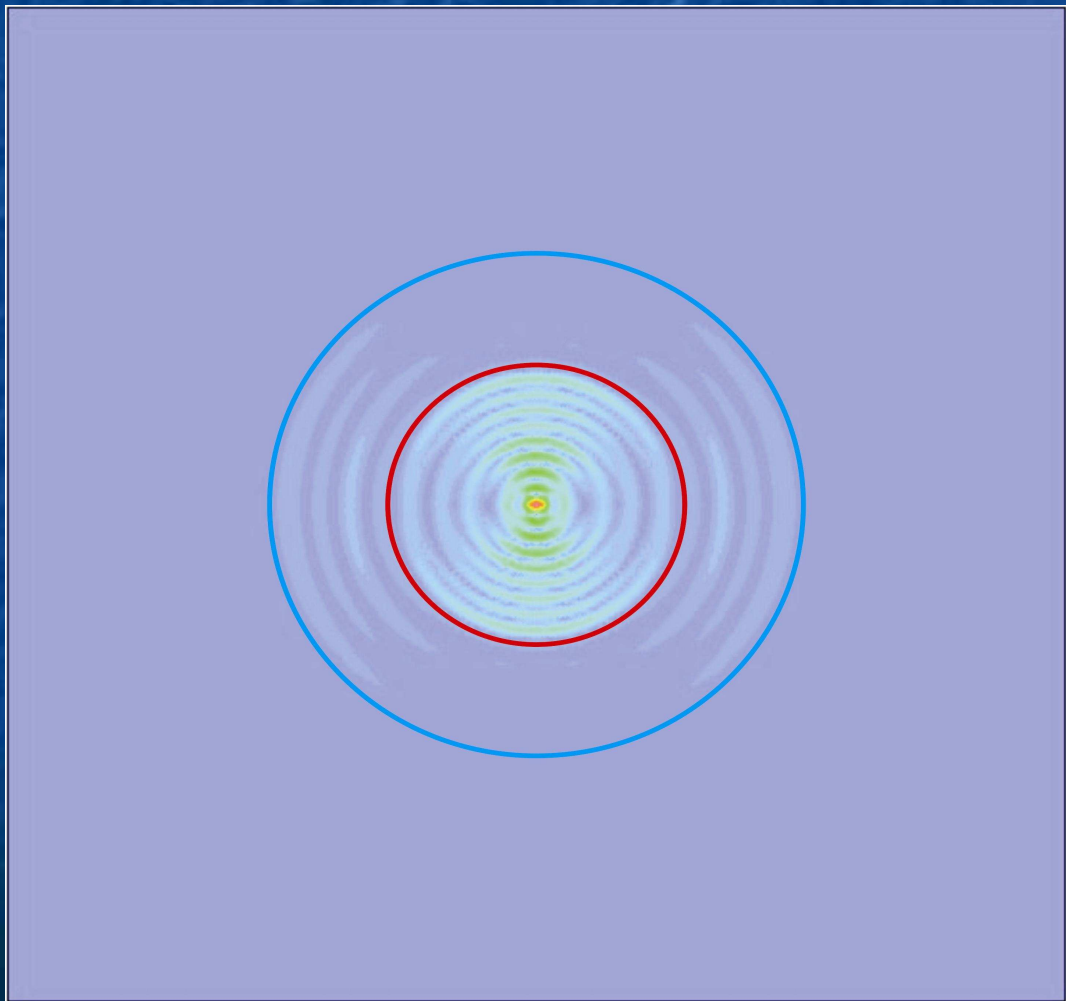


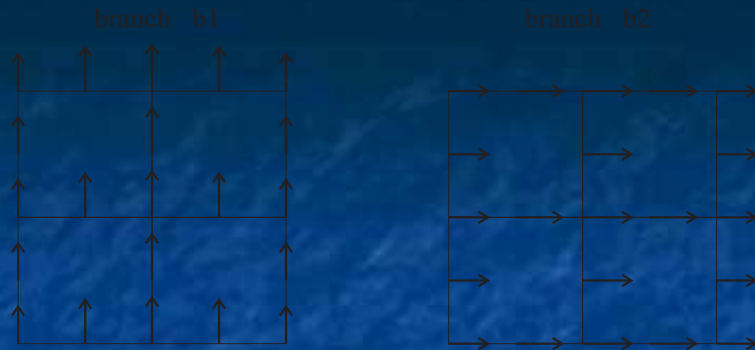
$$\omega H / c_1 = 1.0$$



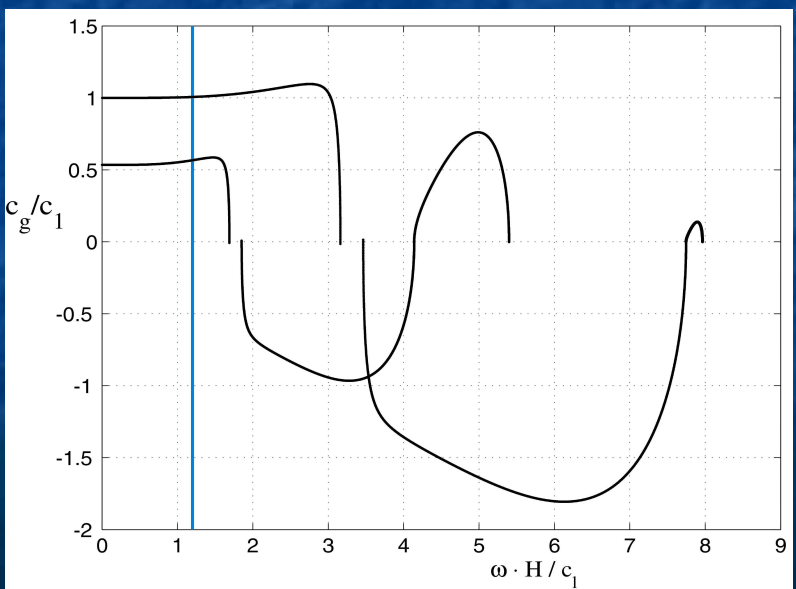
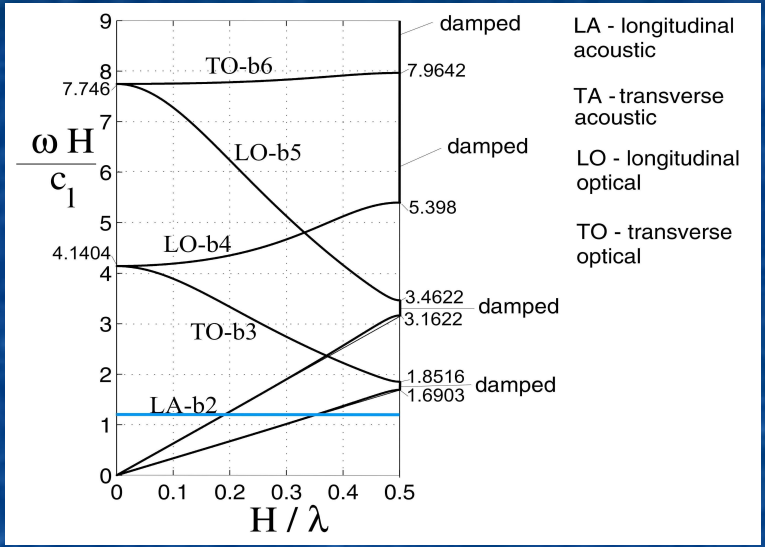
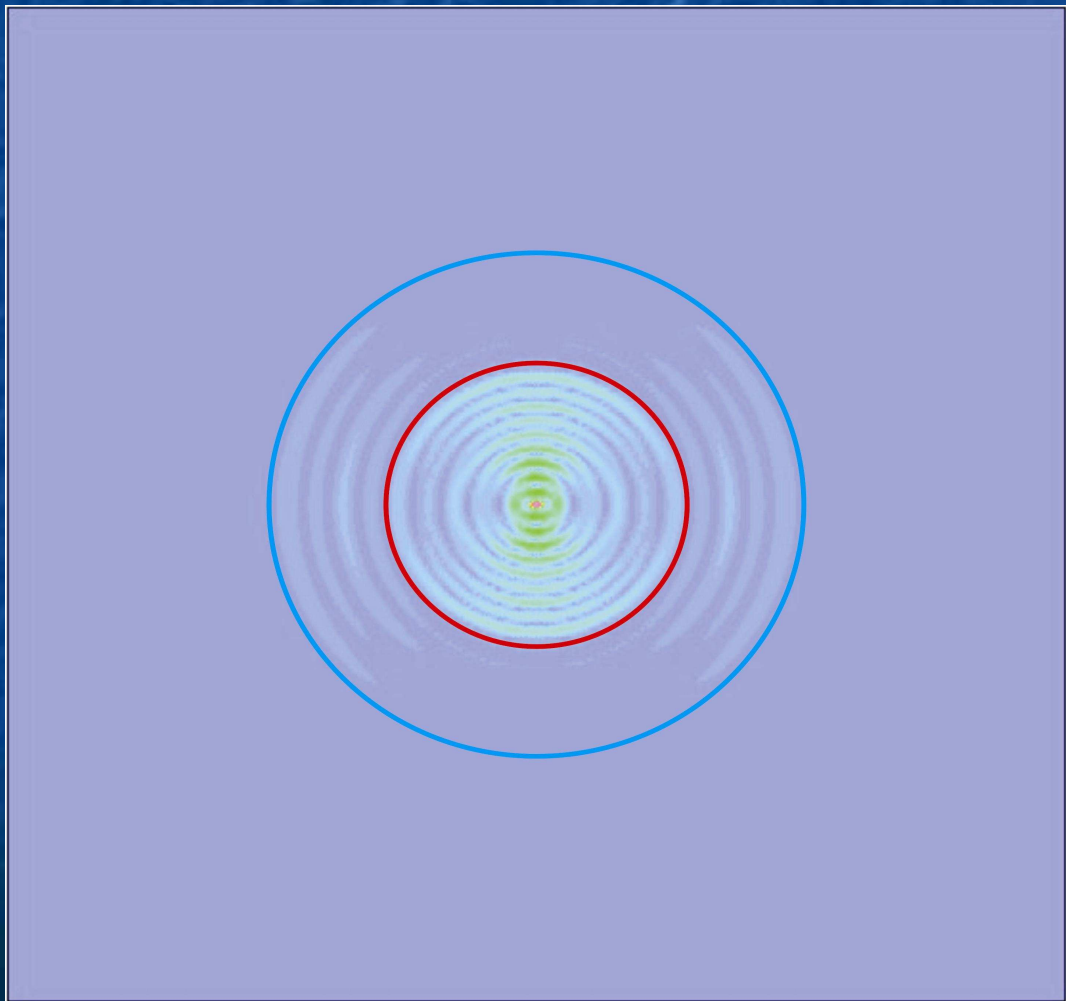


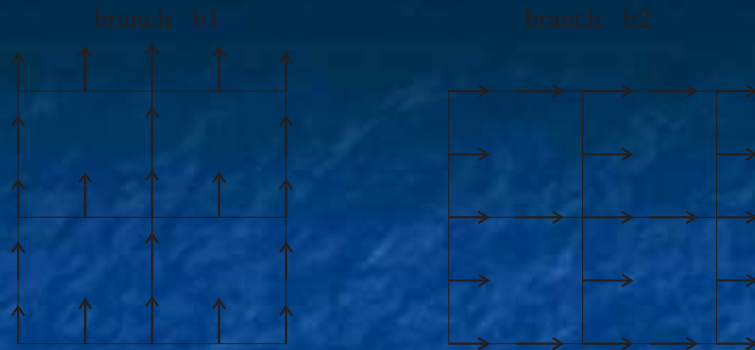
$$\omega H / c_1 = 1.1$$



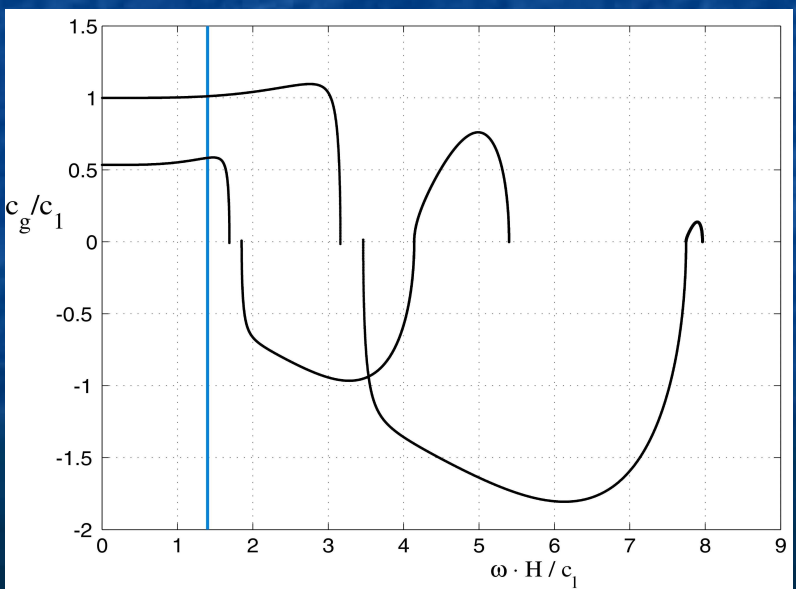
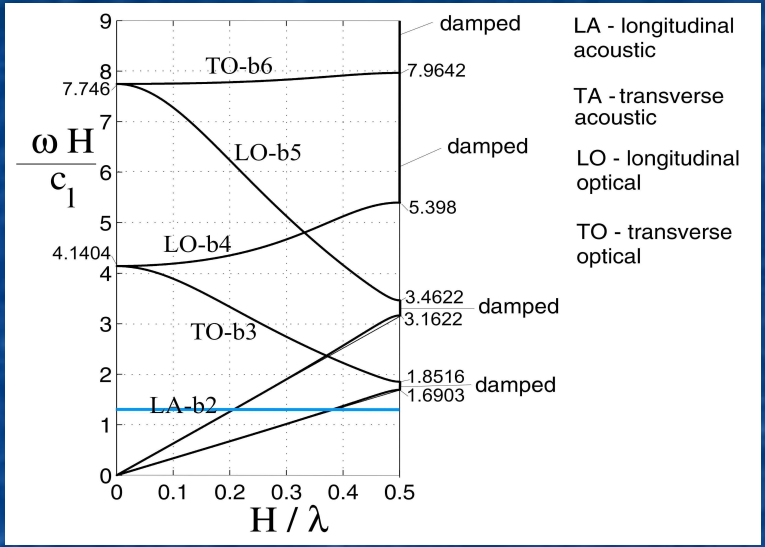
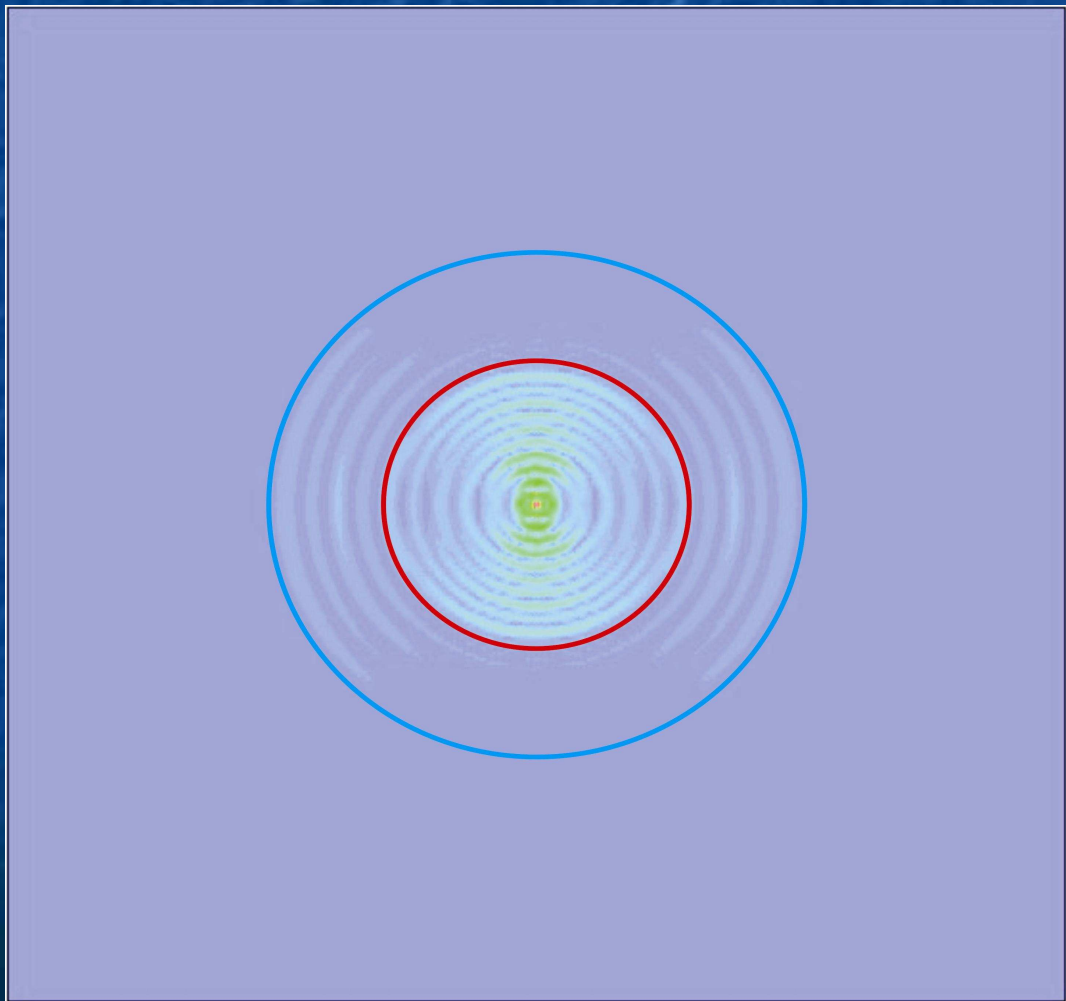


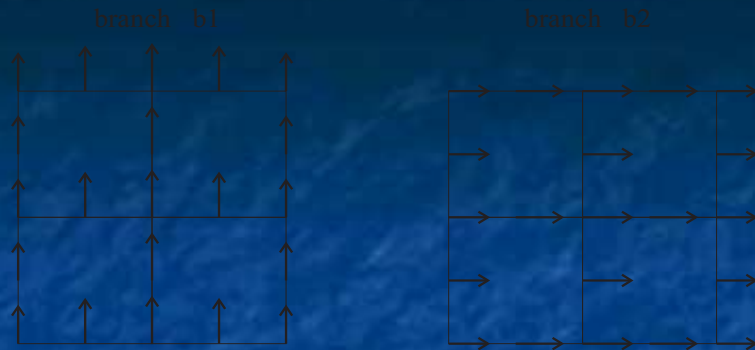
$$\omega H / c_1 = 1.2$$



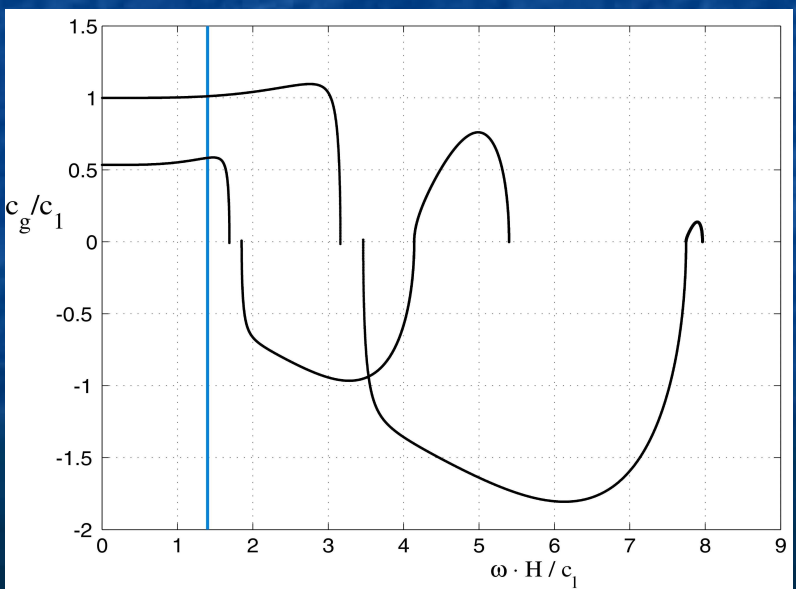
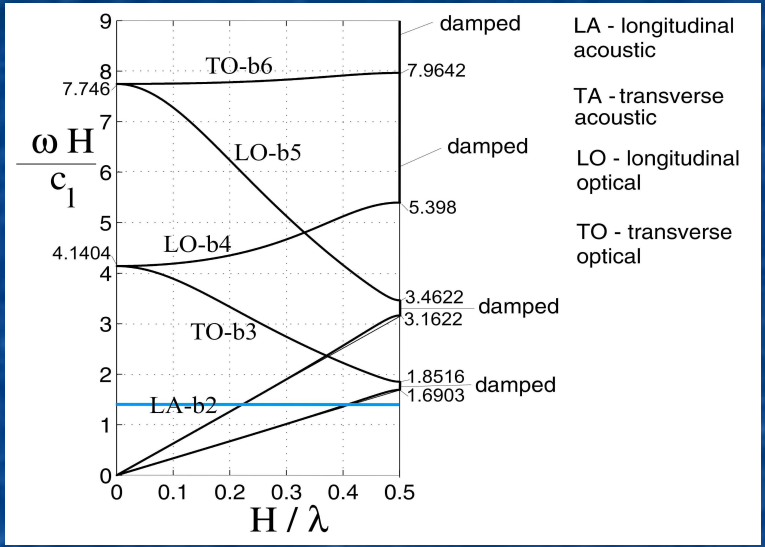
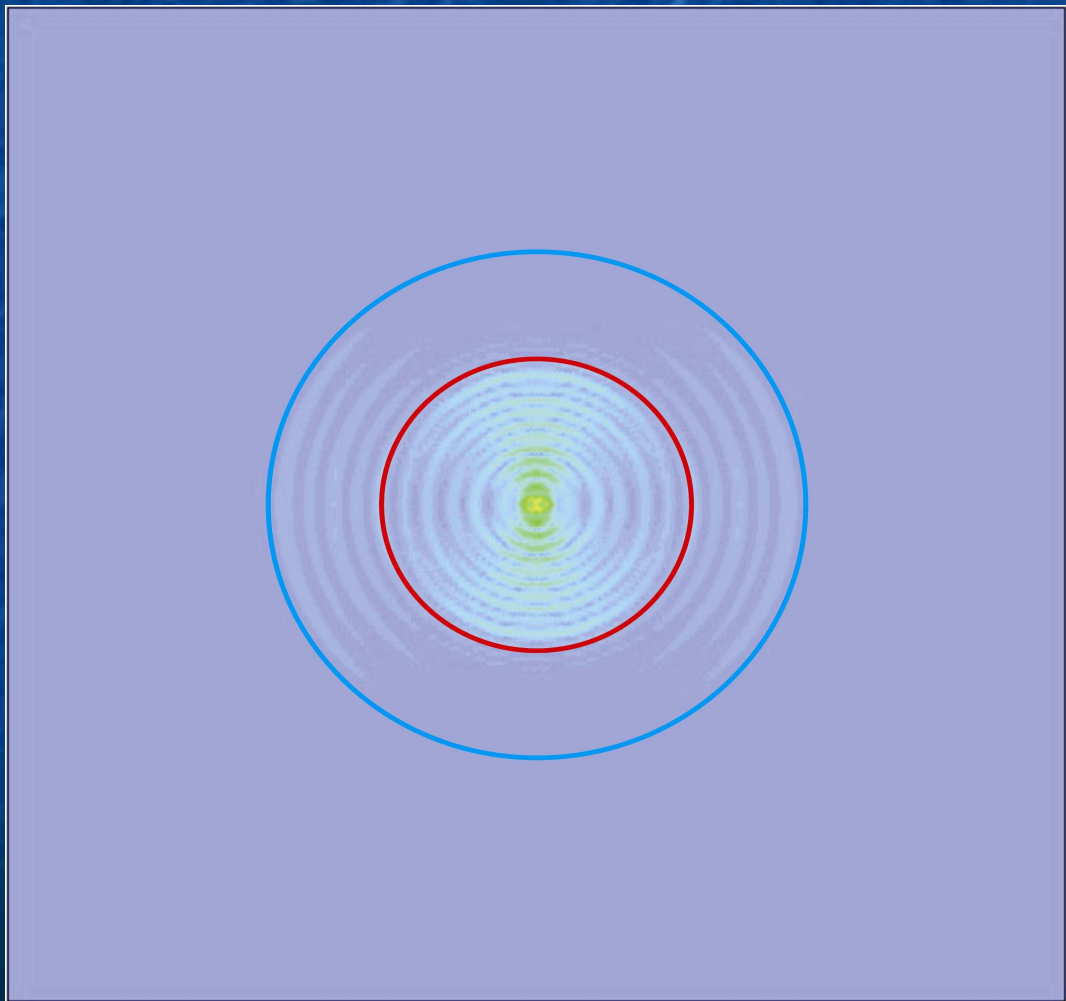


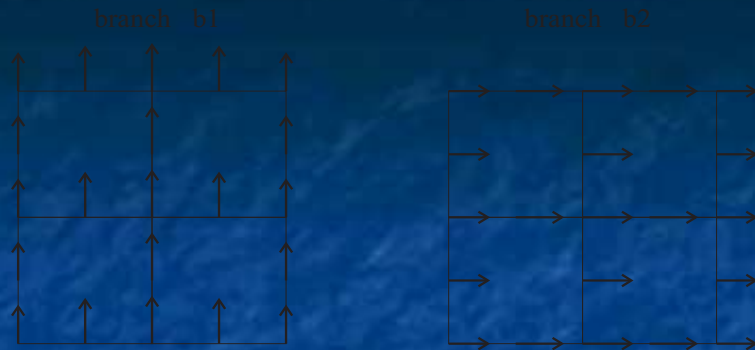
$$\omega H / c_1 = 1.3$$



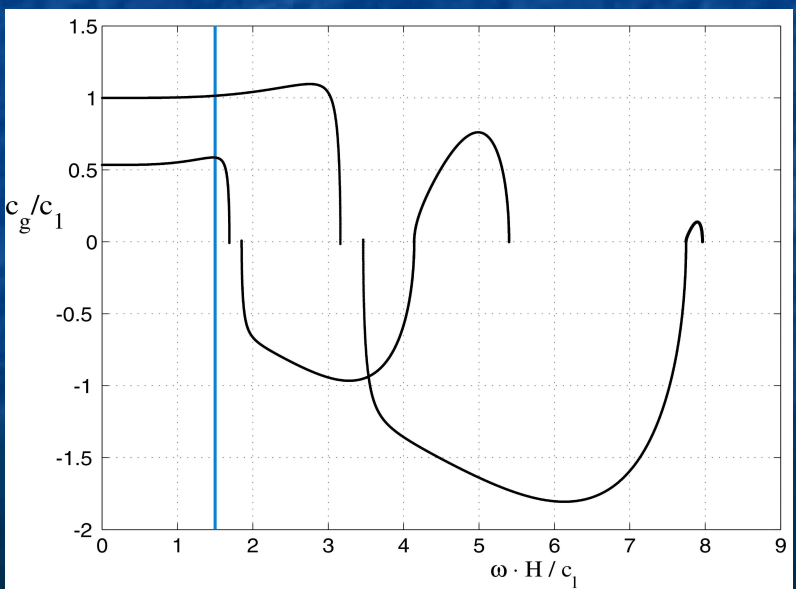
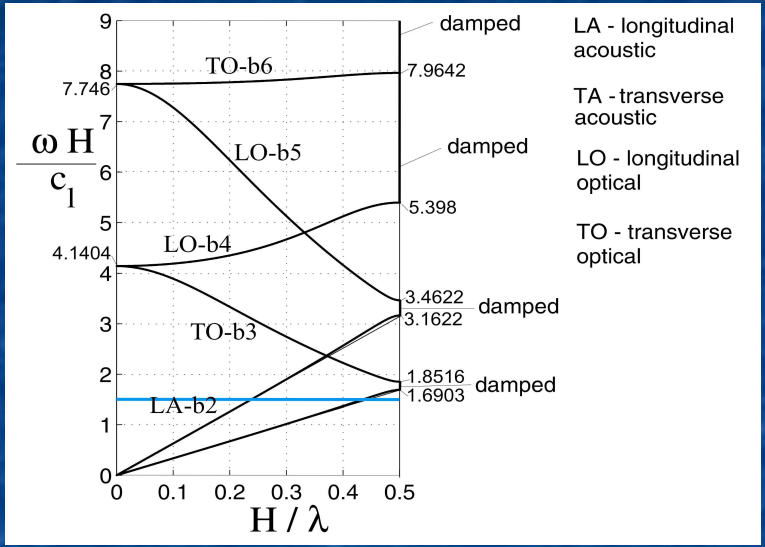
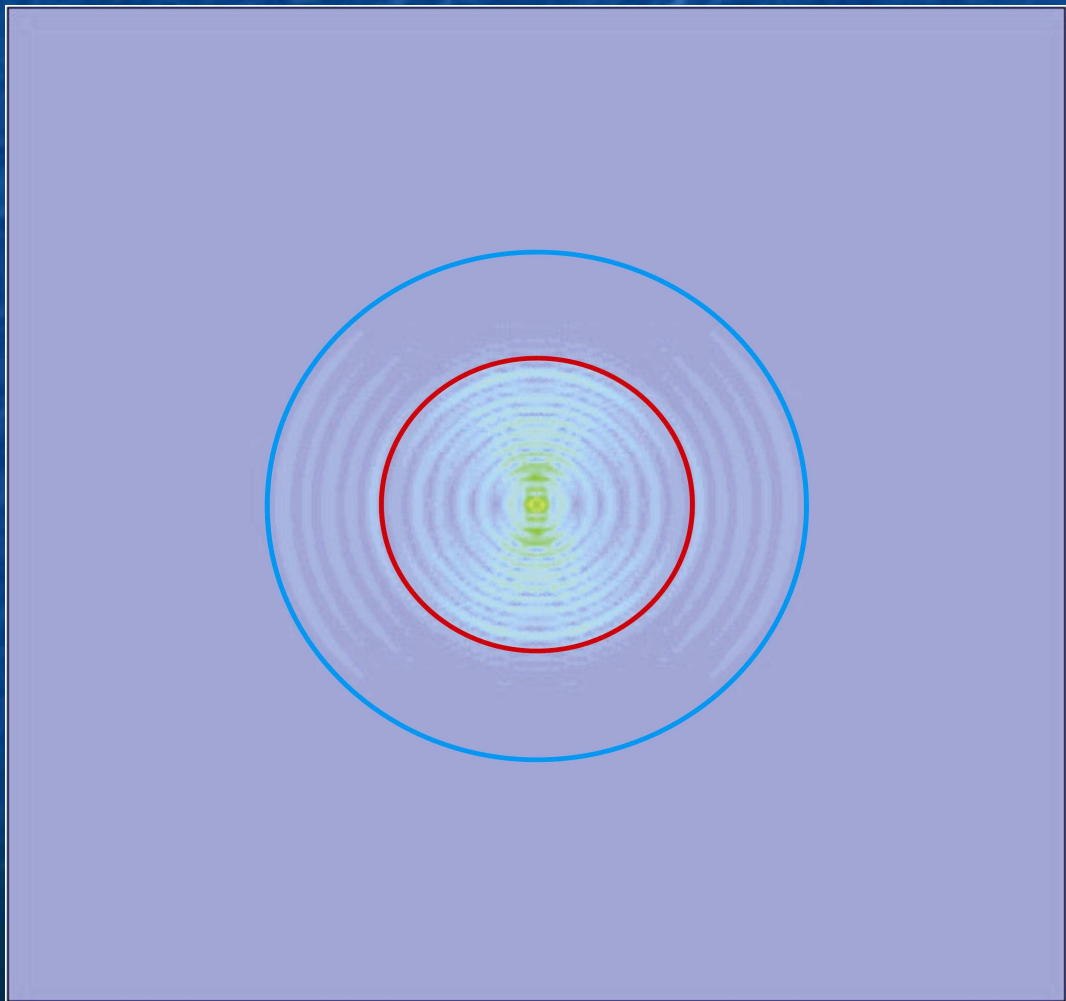


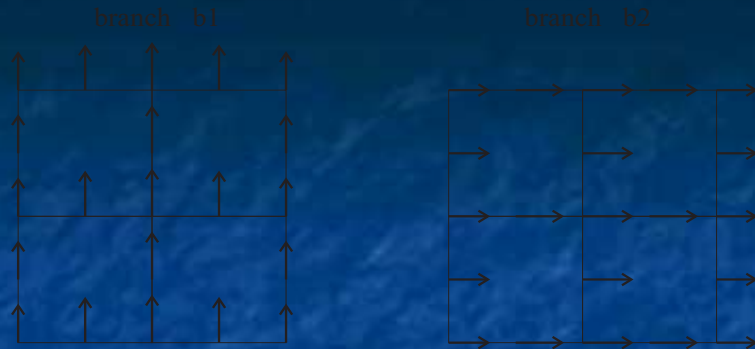
$$\omega H / c_1 = 1.4$$



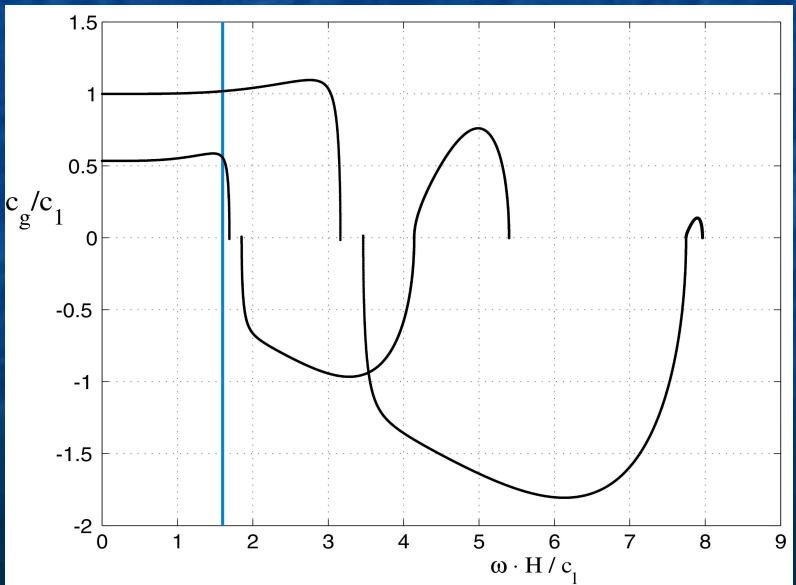
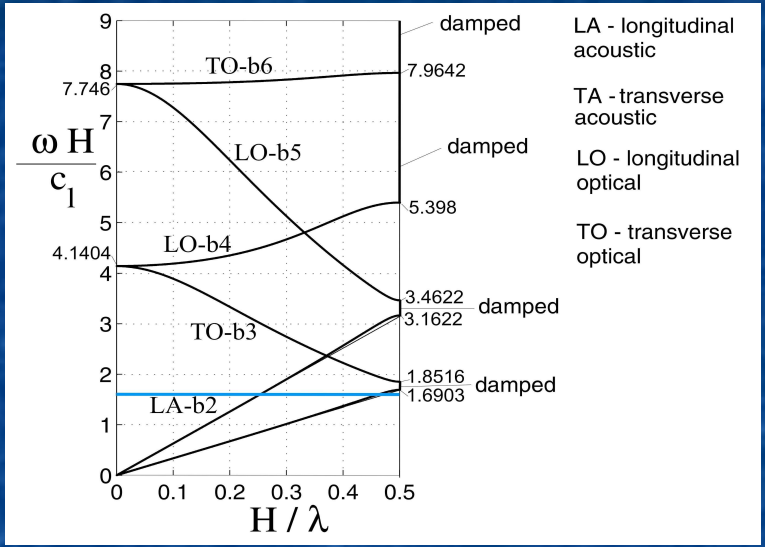
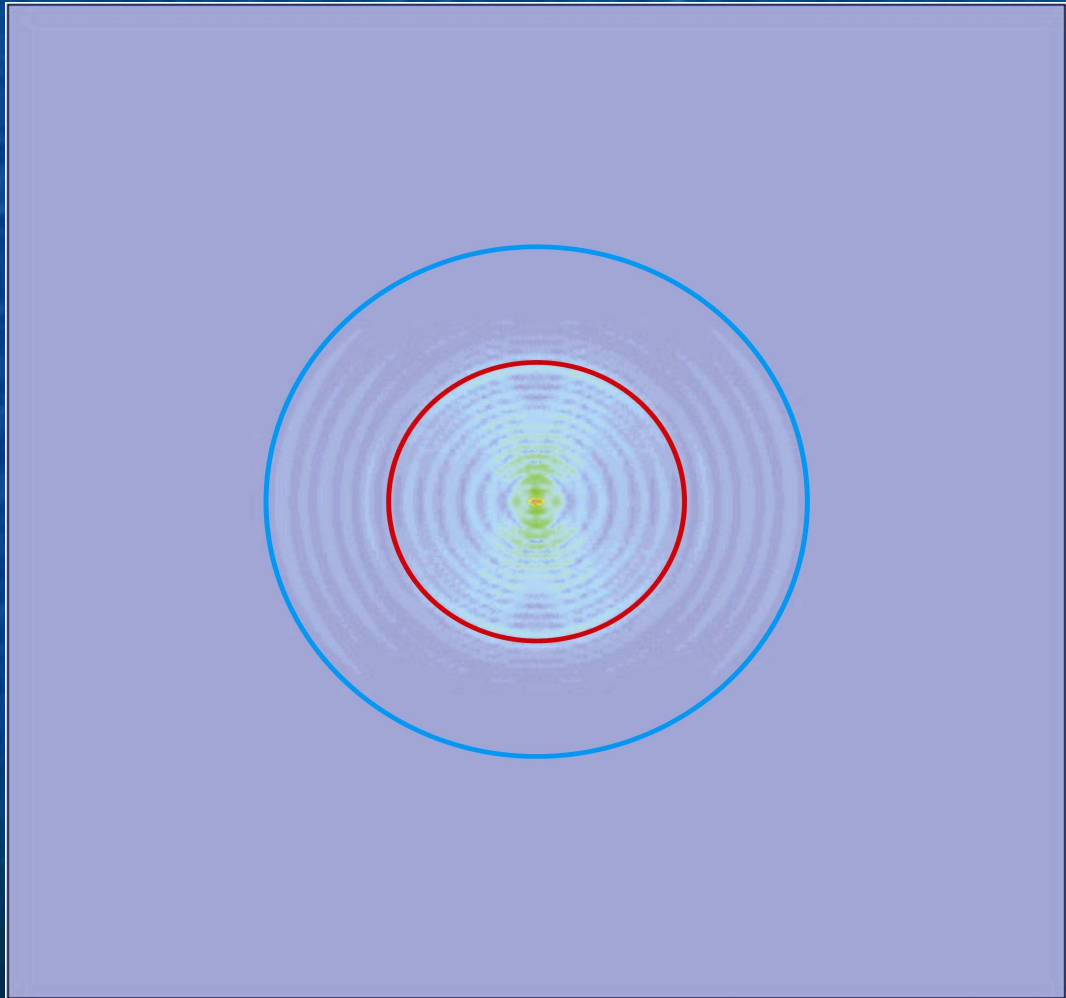


$$\omega H / c_1 = 1.5$$





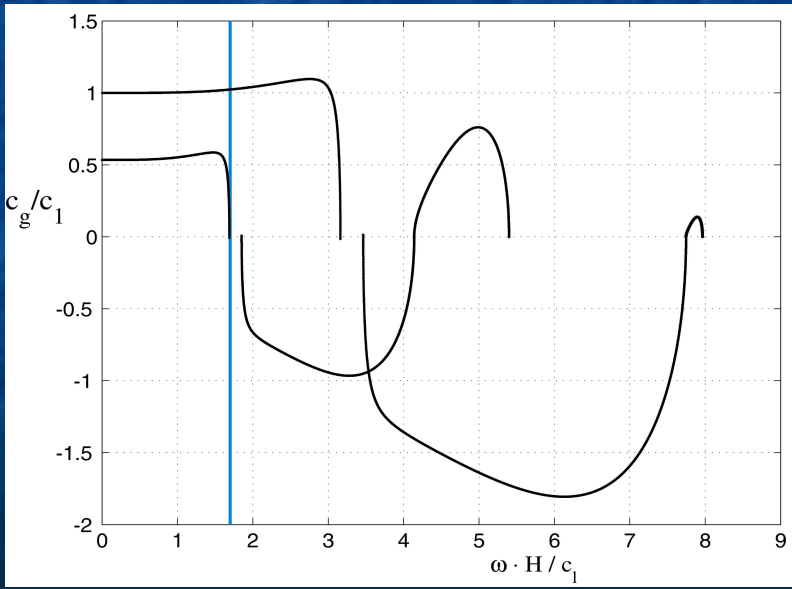
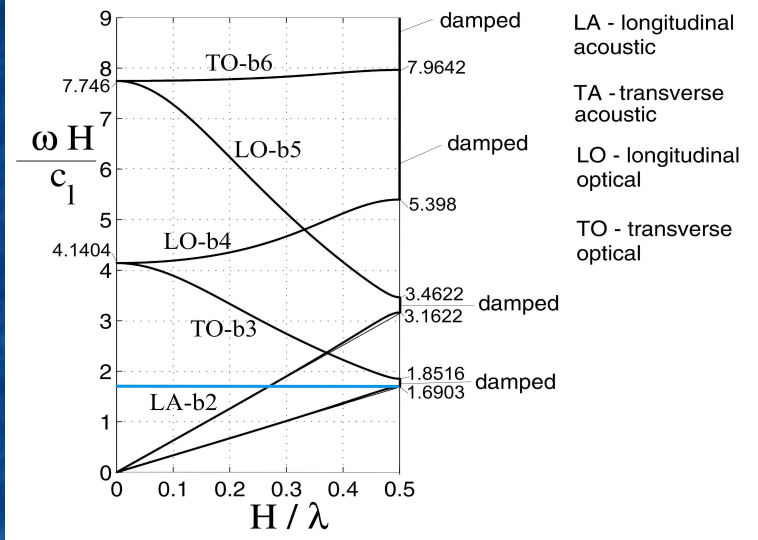
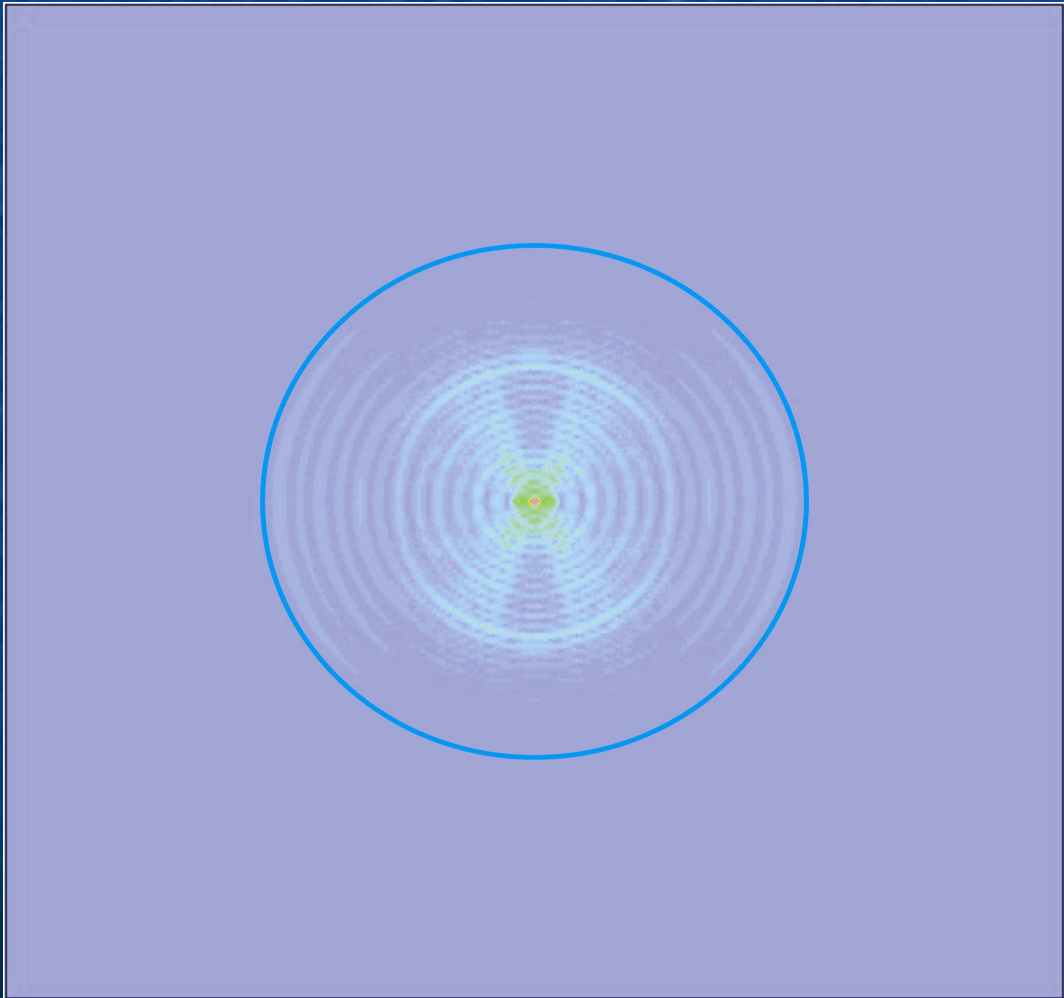
$$\omega H / c_1 = 1.6$$



branch b2



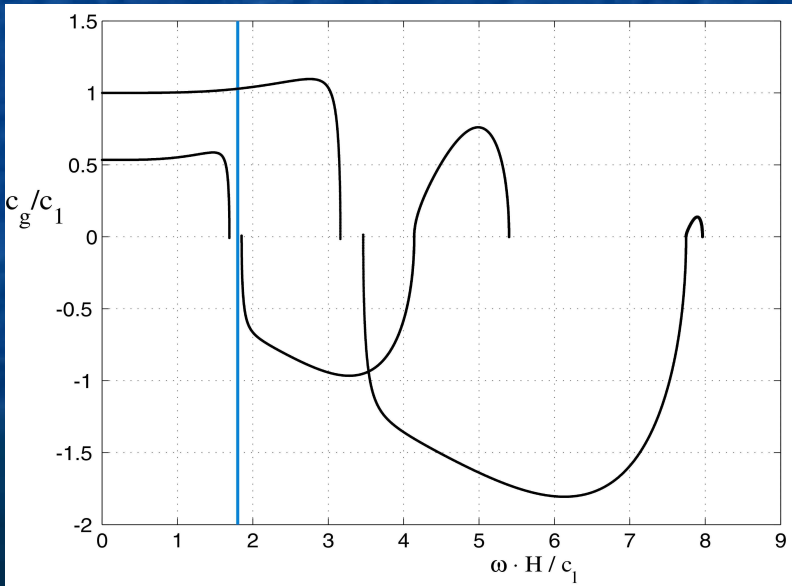
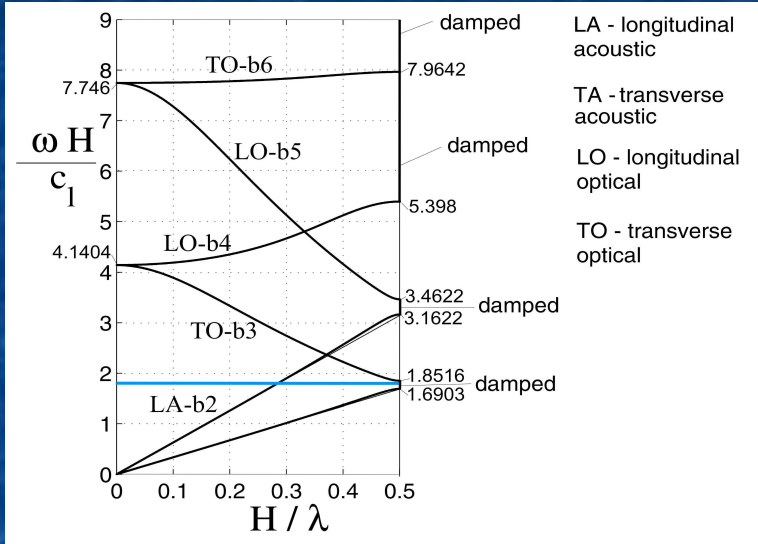
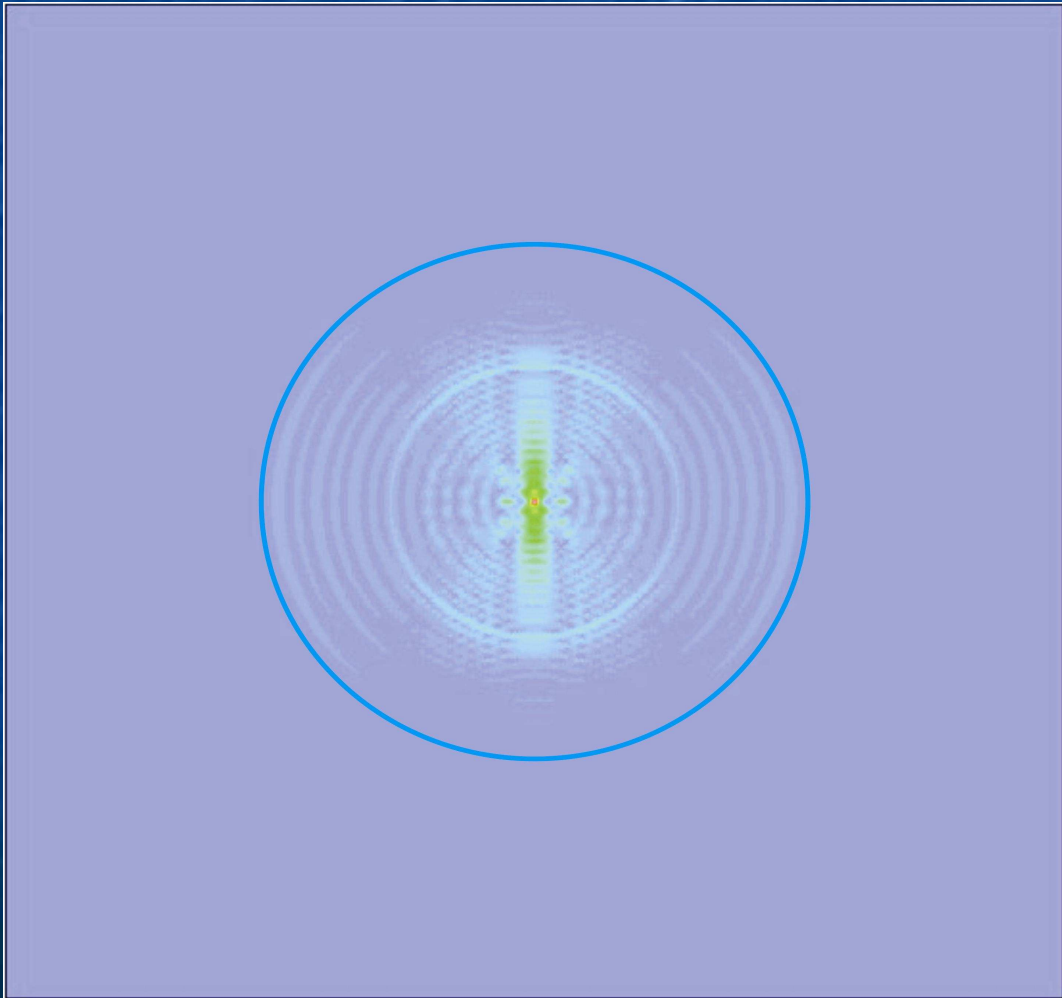
$$\omega H / c_1 = 1.7$$



branch b2



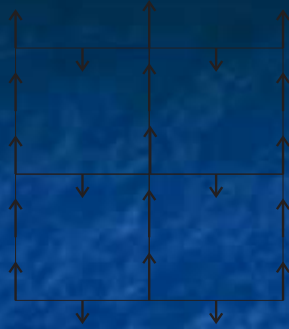
$$\omega H / c_1 = 1.8$$



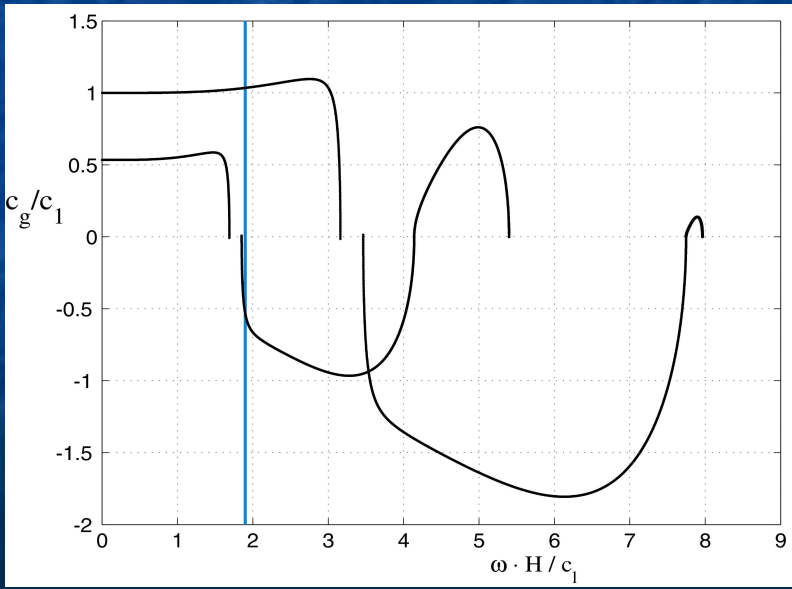
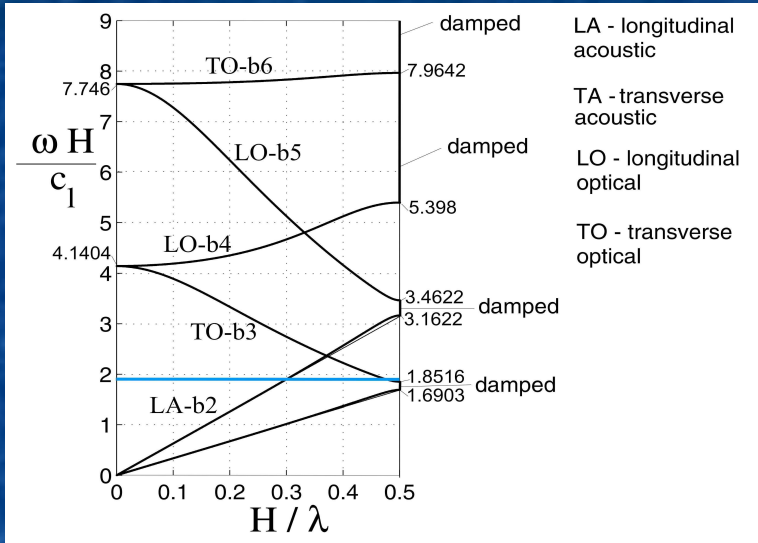
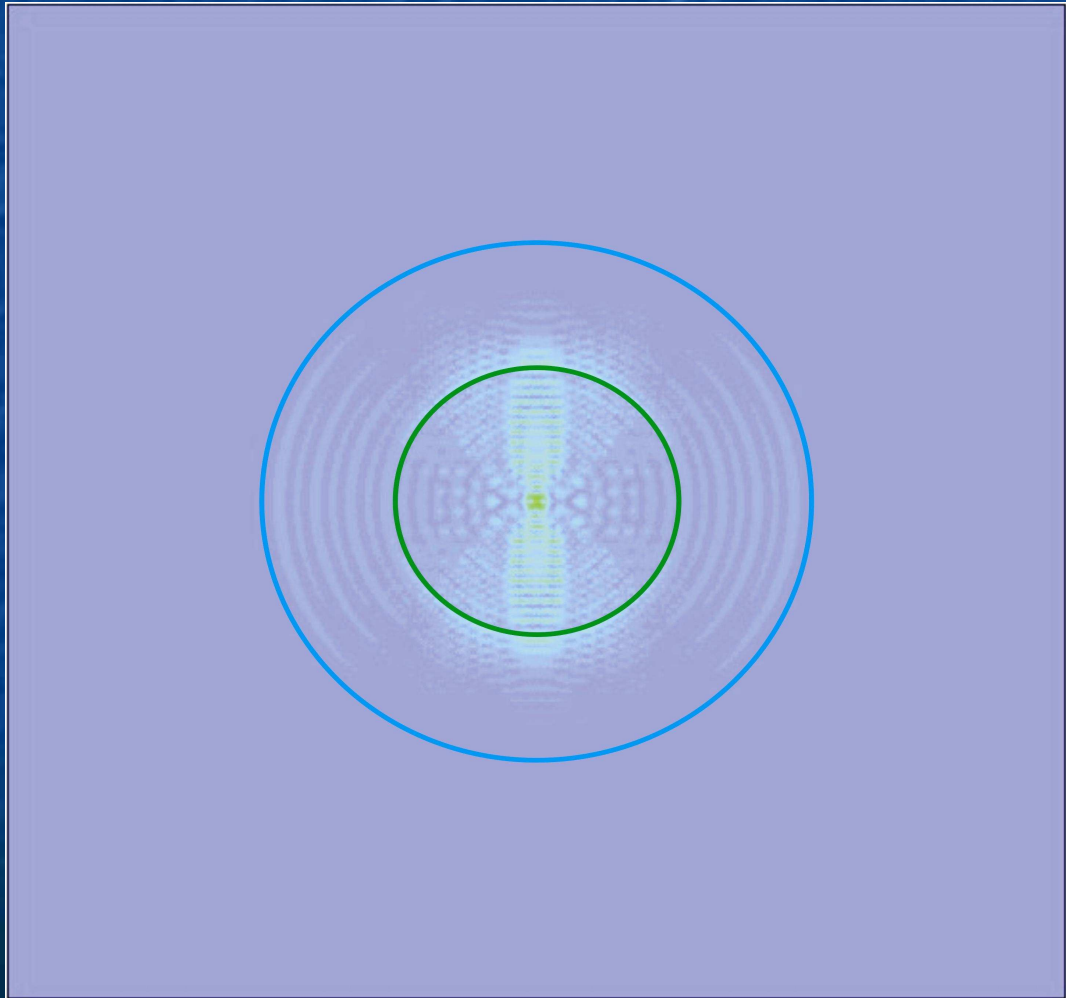
branch b2



branch b3



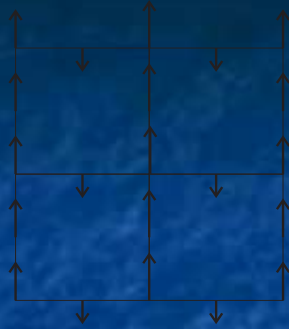
$$\omega H / c_1 = 1.9$$



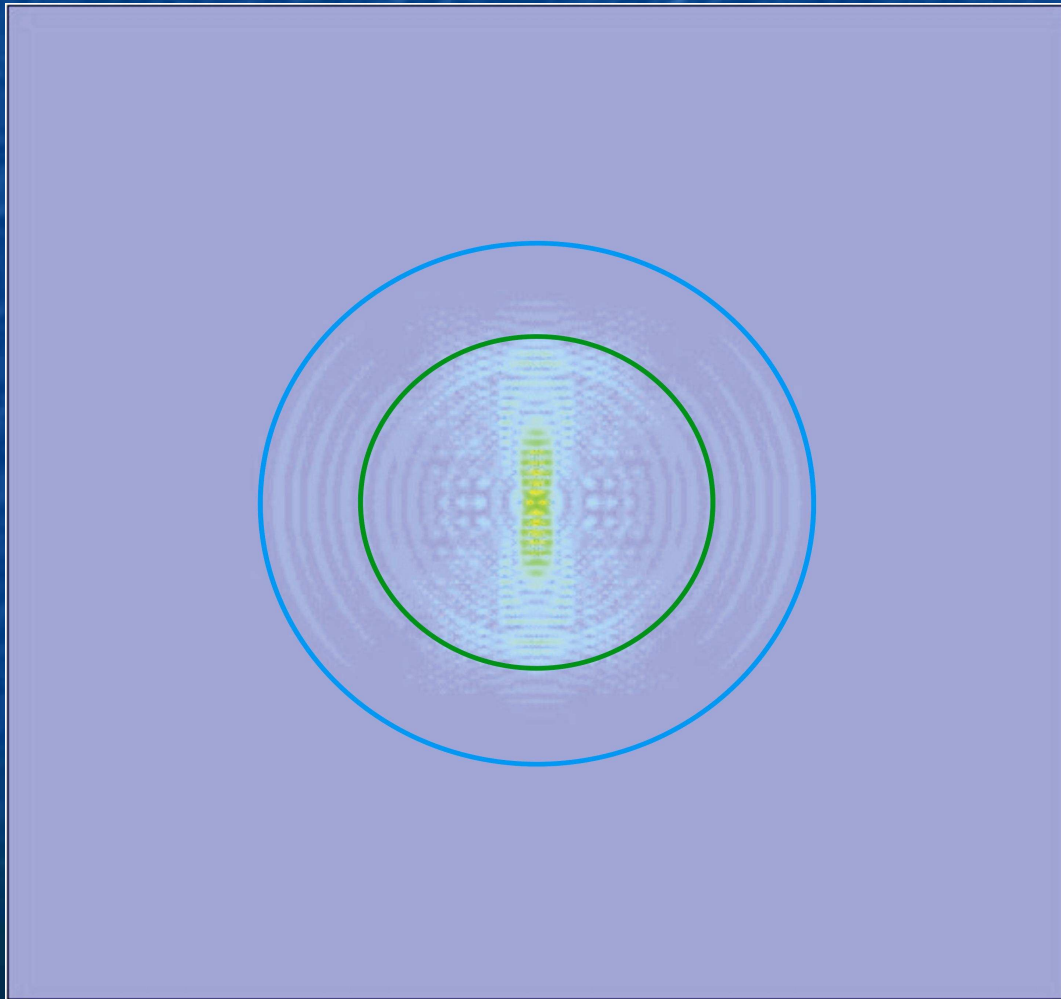
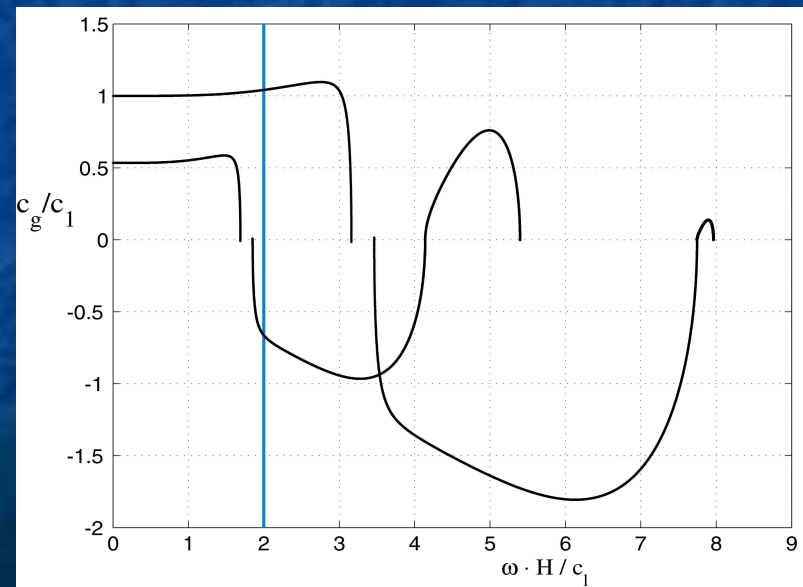
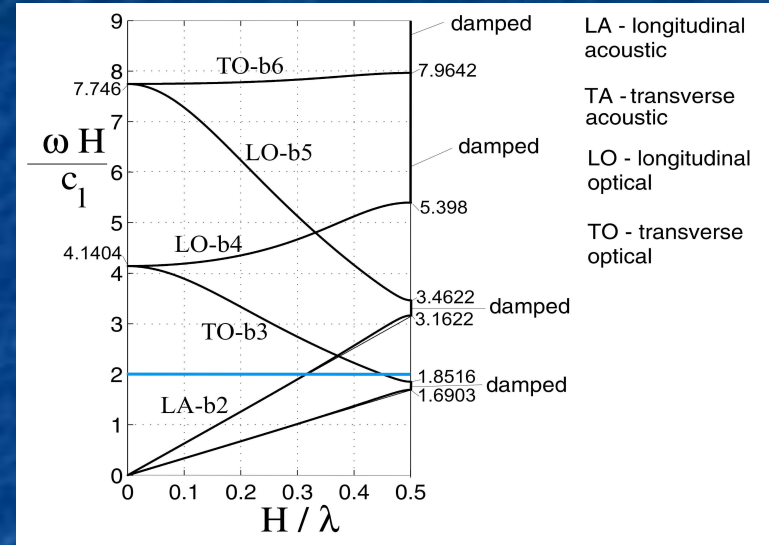
branch b2



branch b3



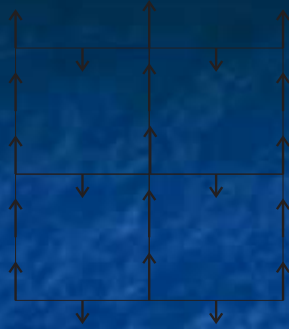
$$\omega H / c_1 = 2.0$$



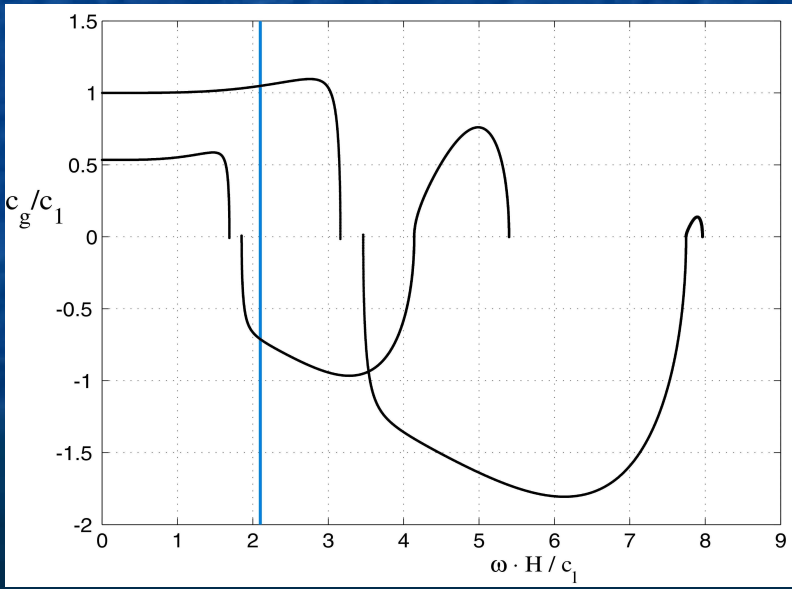
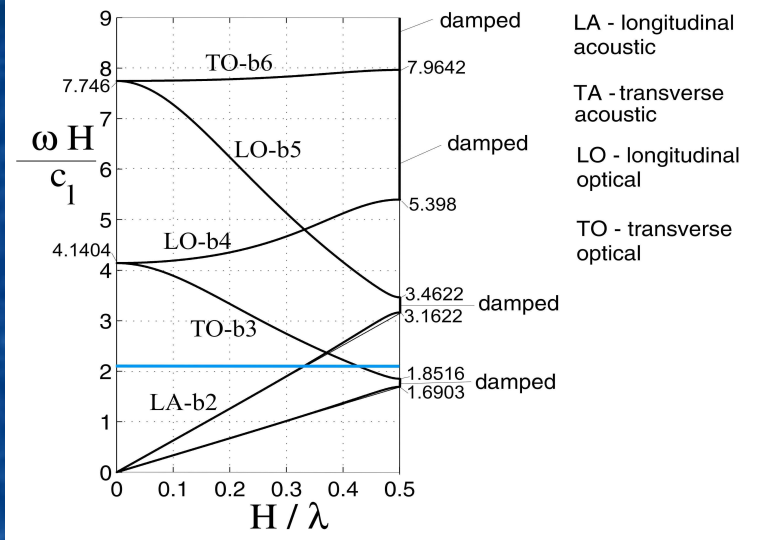
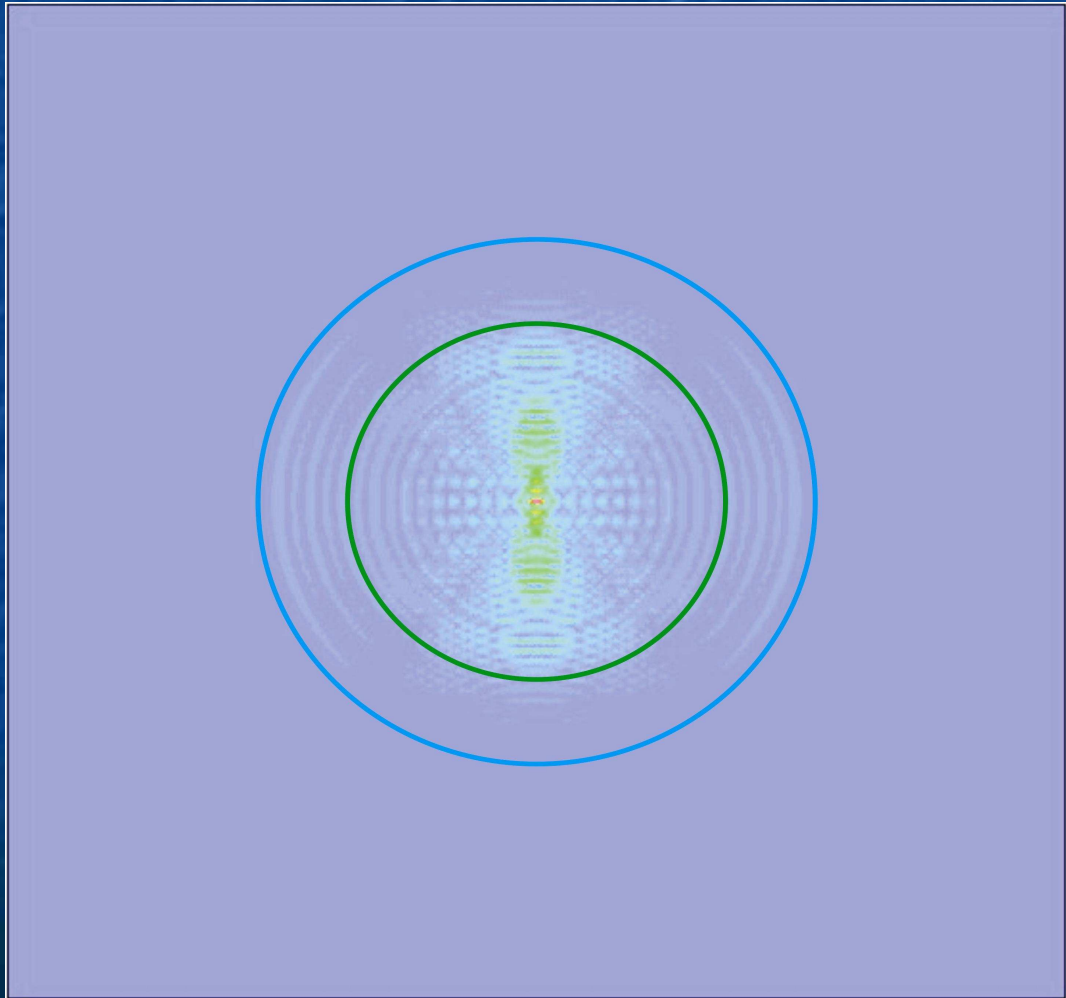
branch b2



branch b3



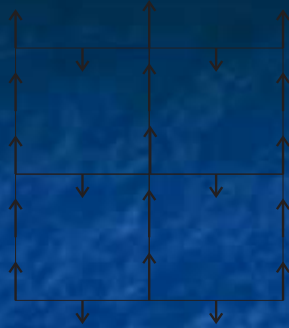
$$\omega H / c_1 = 2.1$$



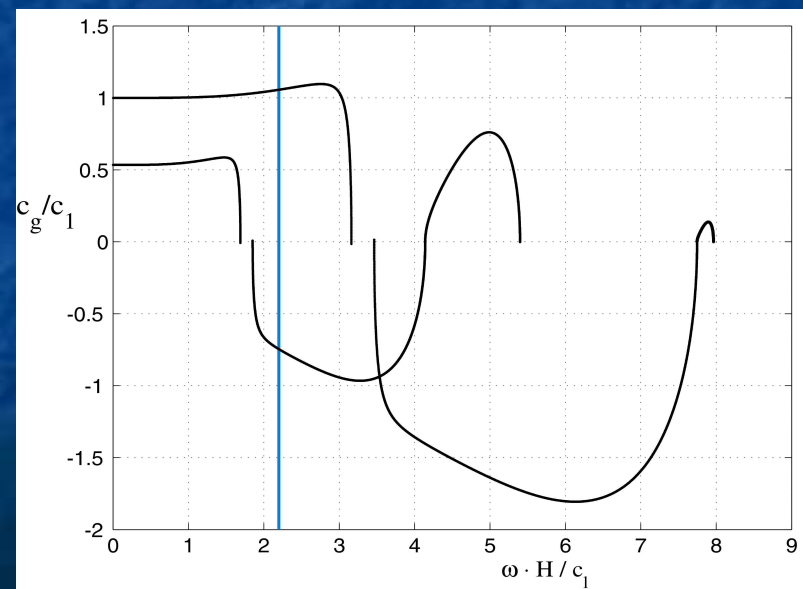
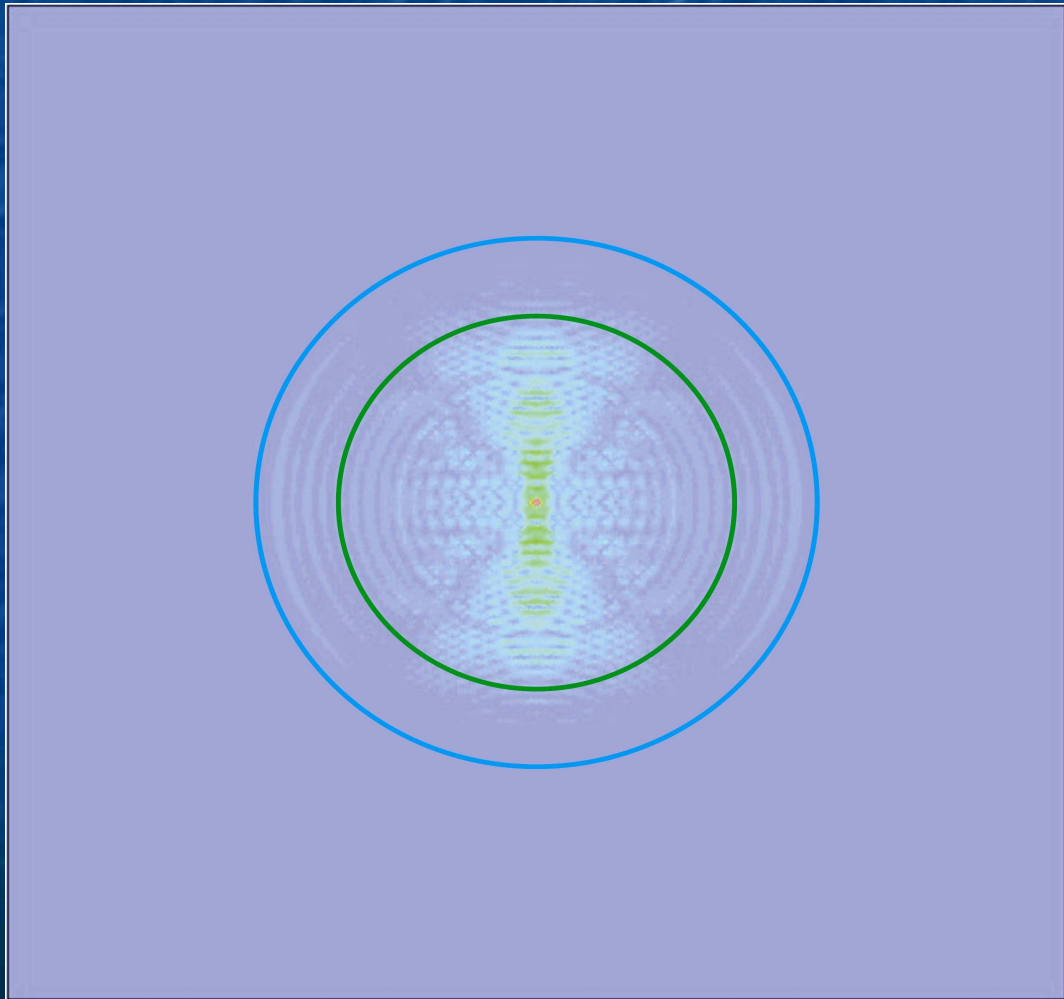
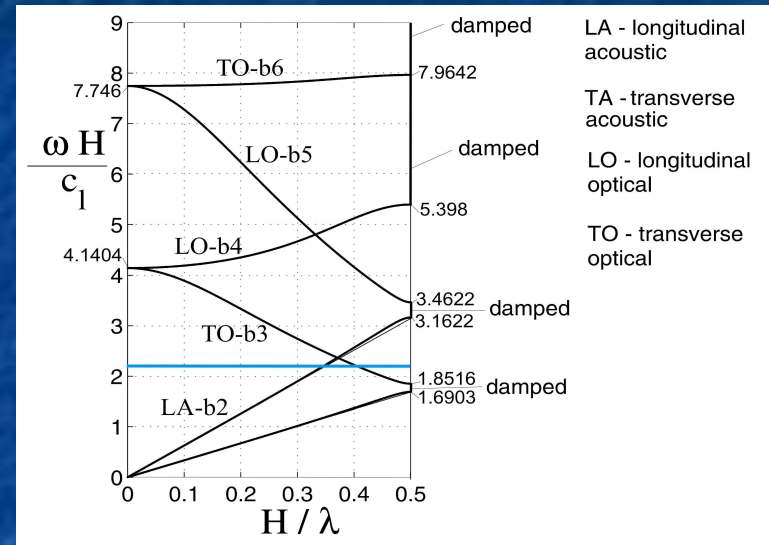
branch b2



branch b3



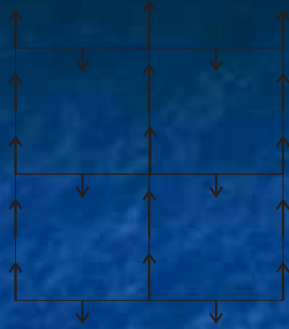
$$\omega H / c_1 = 2.2$$



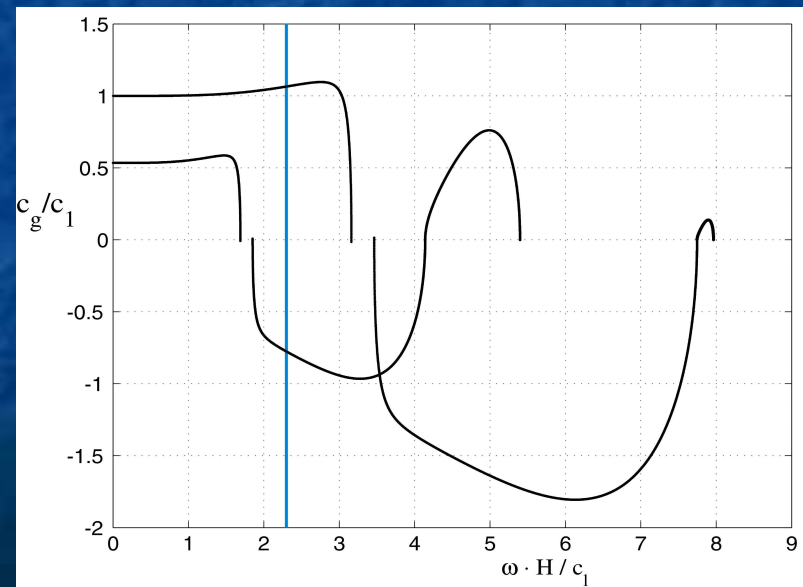
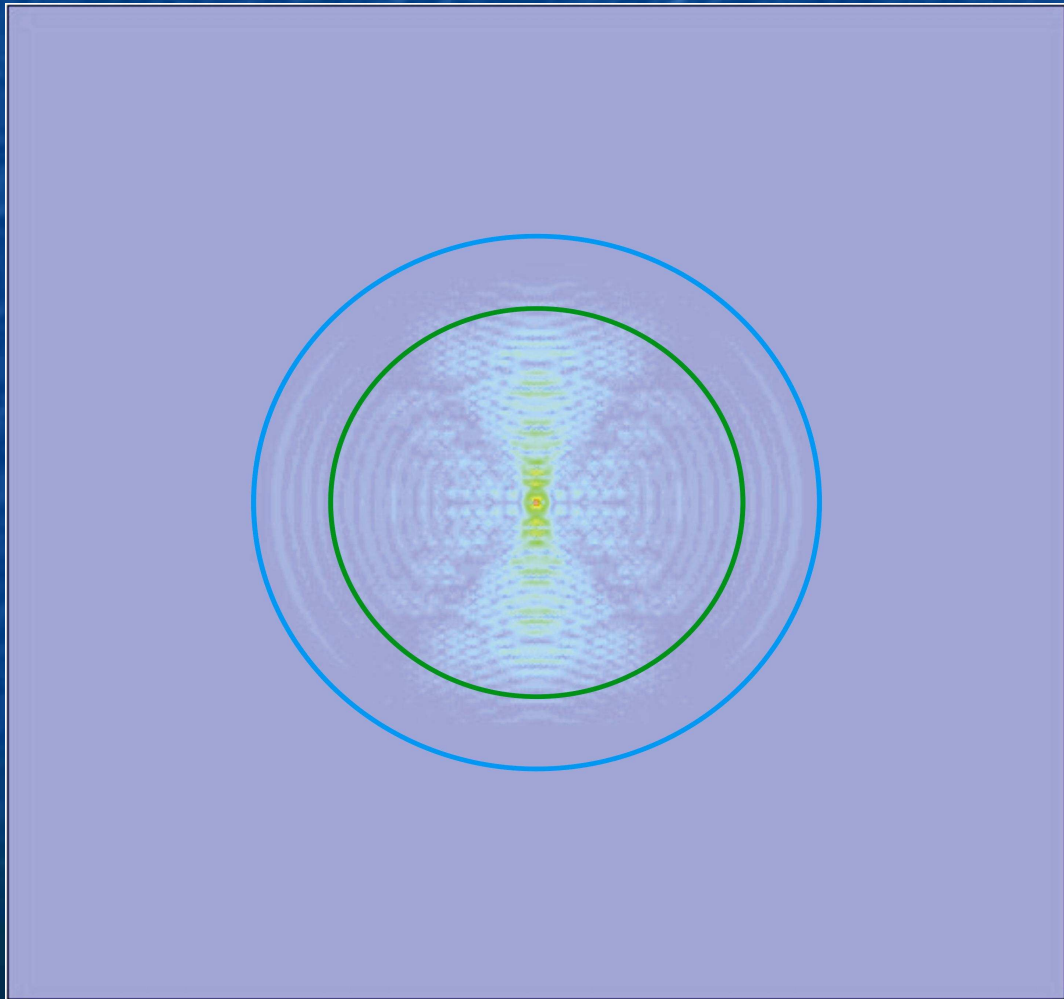
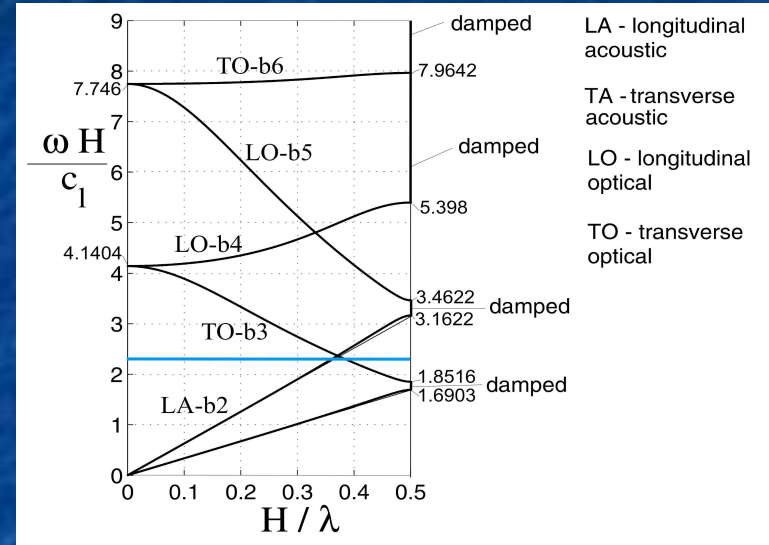
branch b2



branch b3



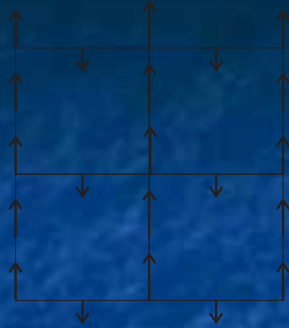
$$\omega H / c_1 = 2.3$$



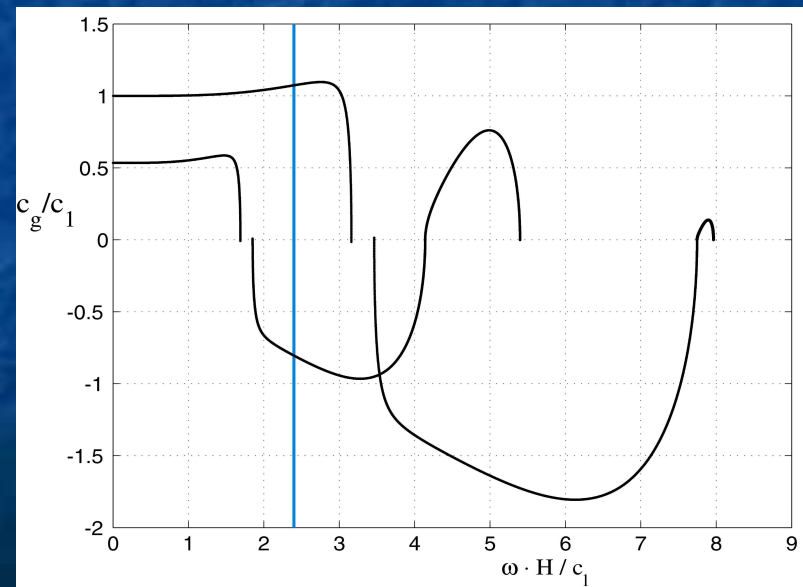
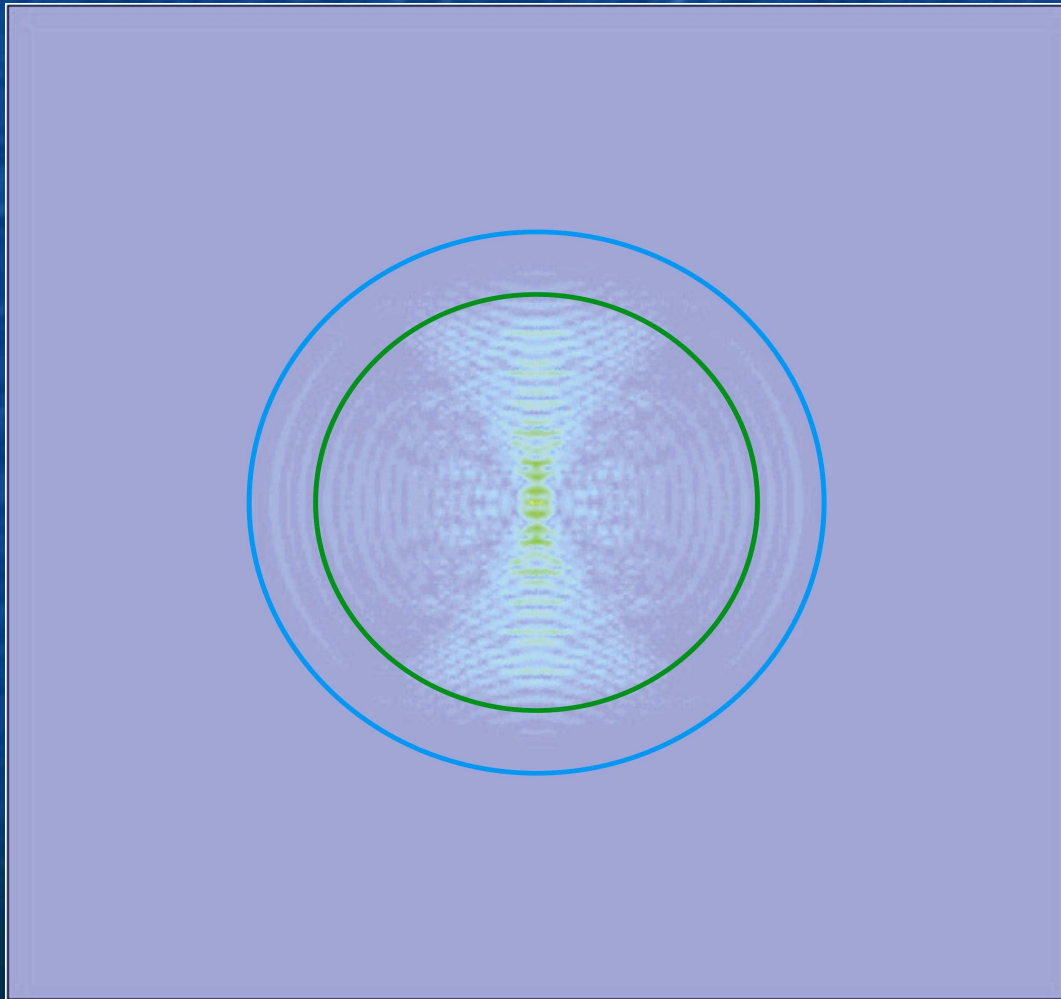
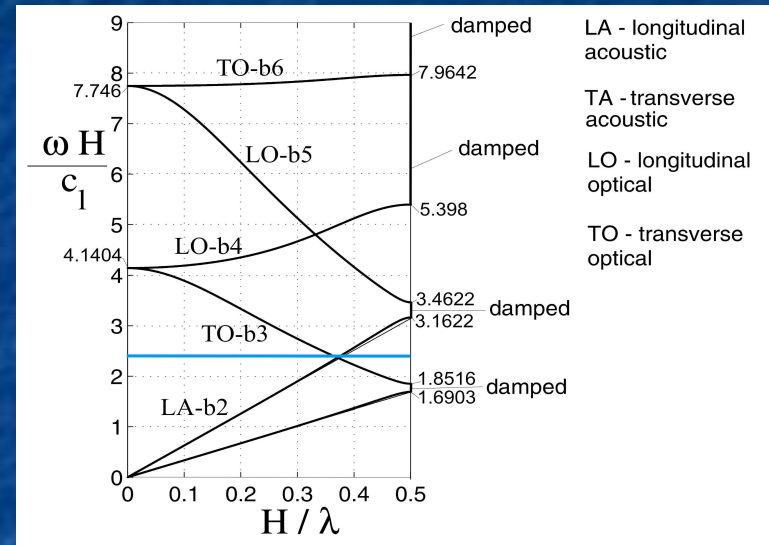
branch b2



branch b3



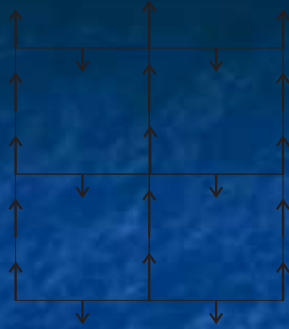
$$\omega H / c_1 = 2.4$$



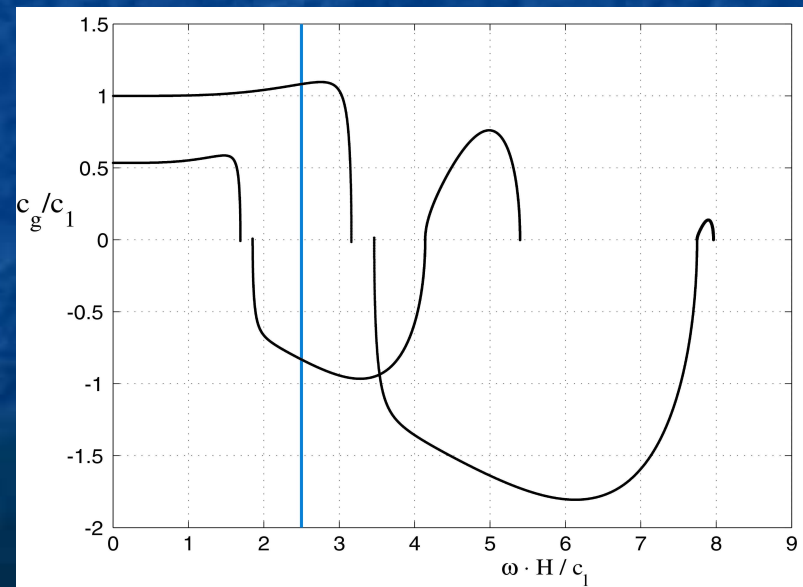
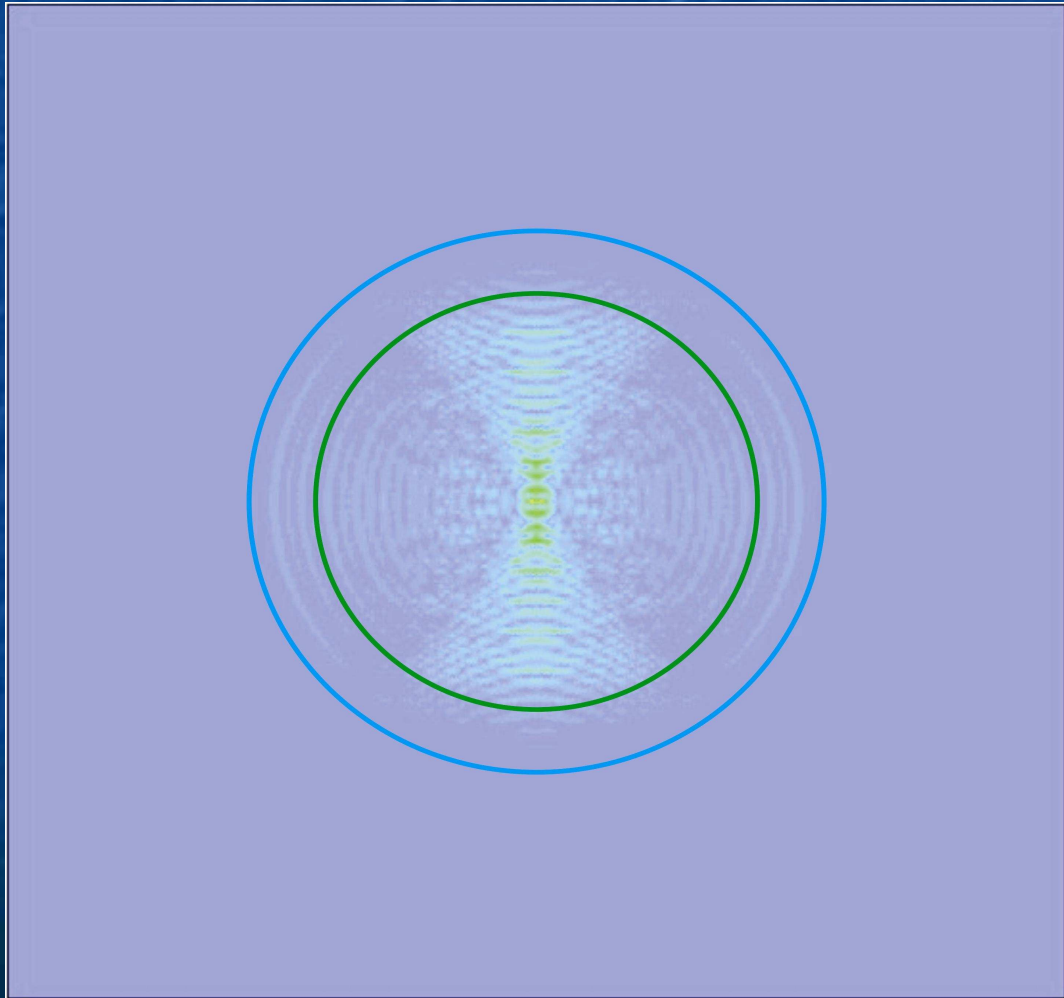
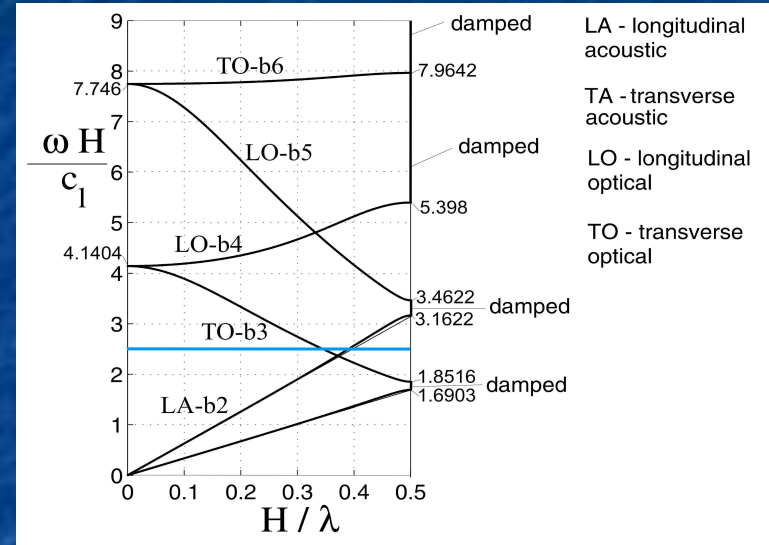
branch b2



branch b3



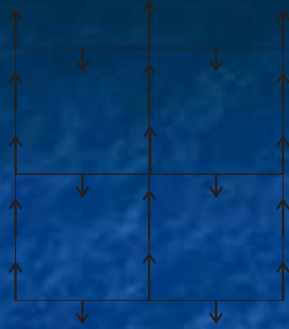
$$\omega H / c_1 = 2.5$$



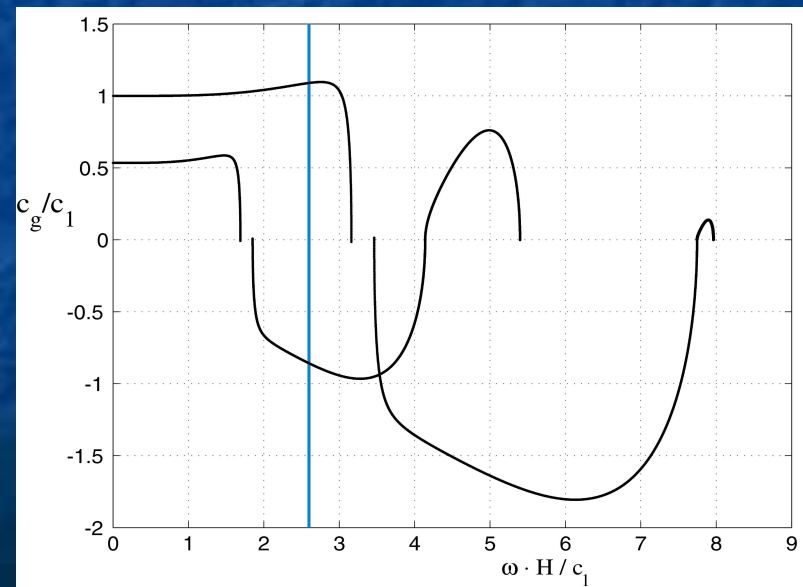
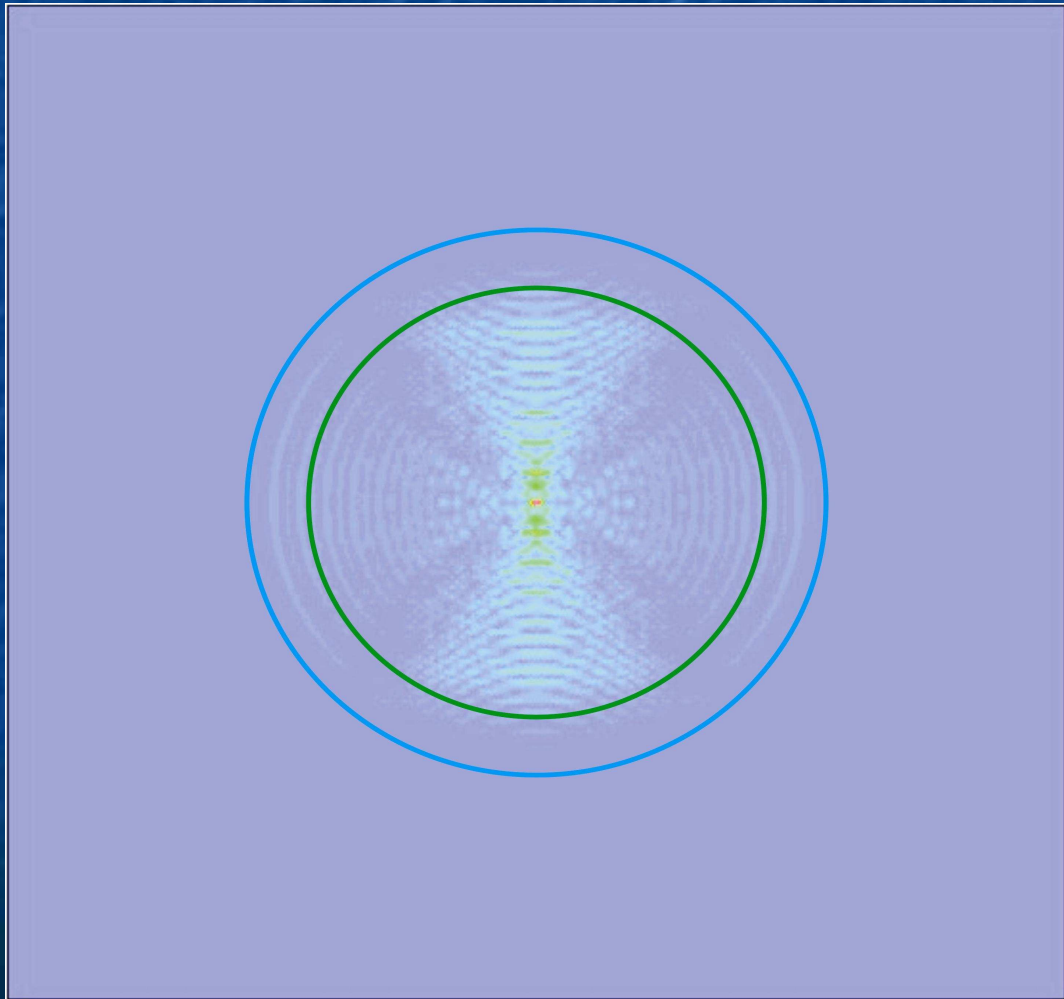
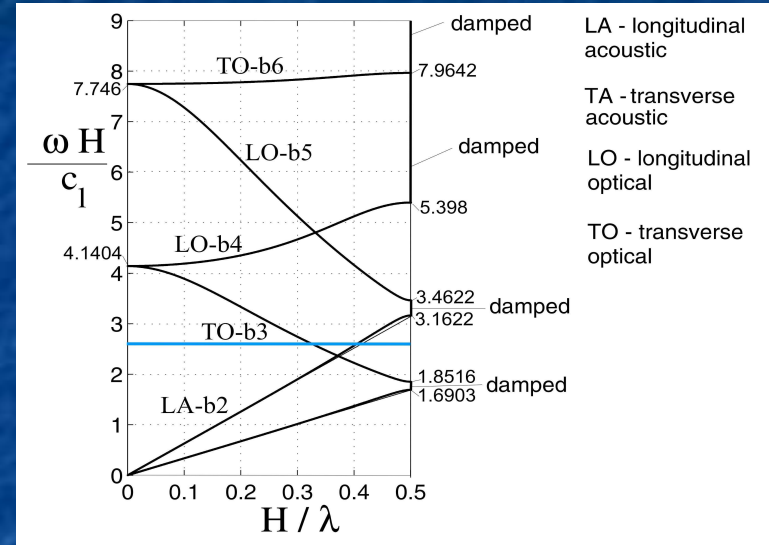
branch b2



branch b3



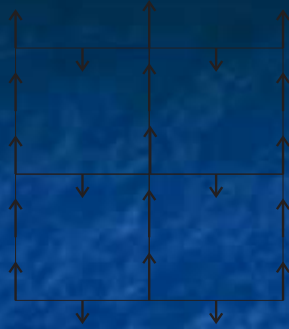
$$\omega H / c_1 = 2.6$$



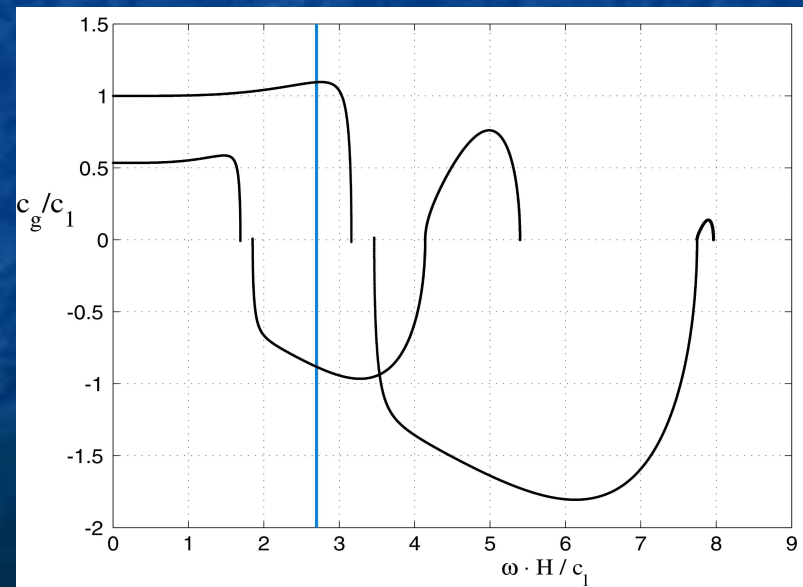
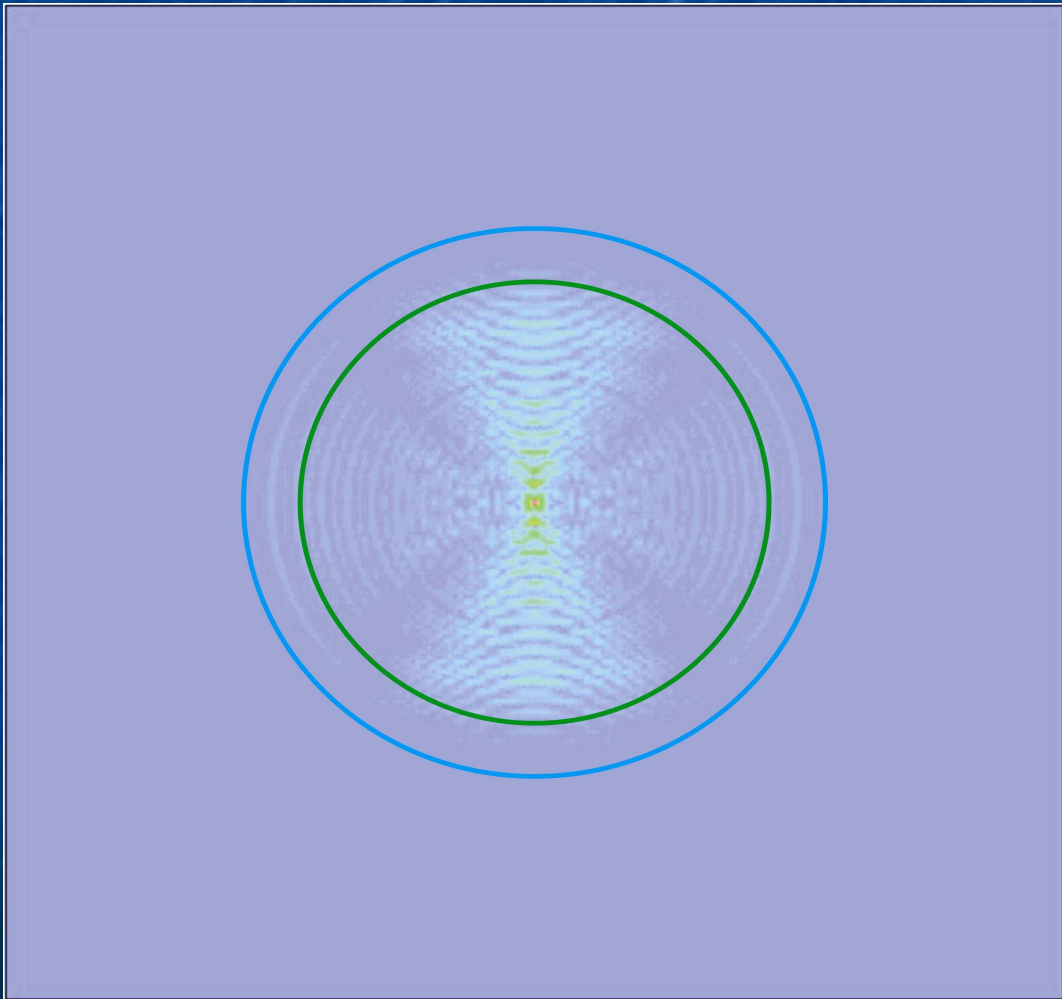
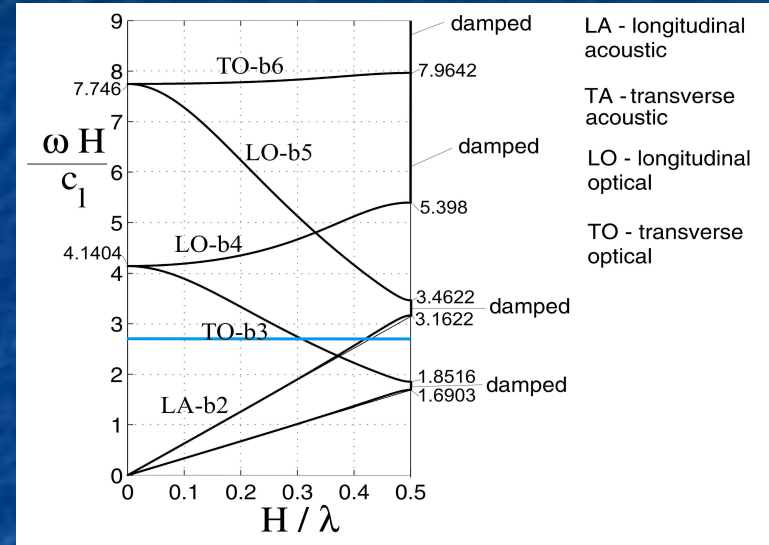
branch b2



branch b3



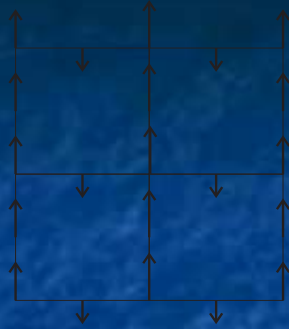
$$\omega H / c_1 = 2.7$$



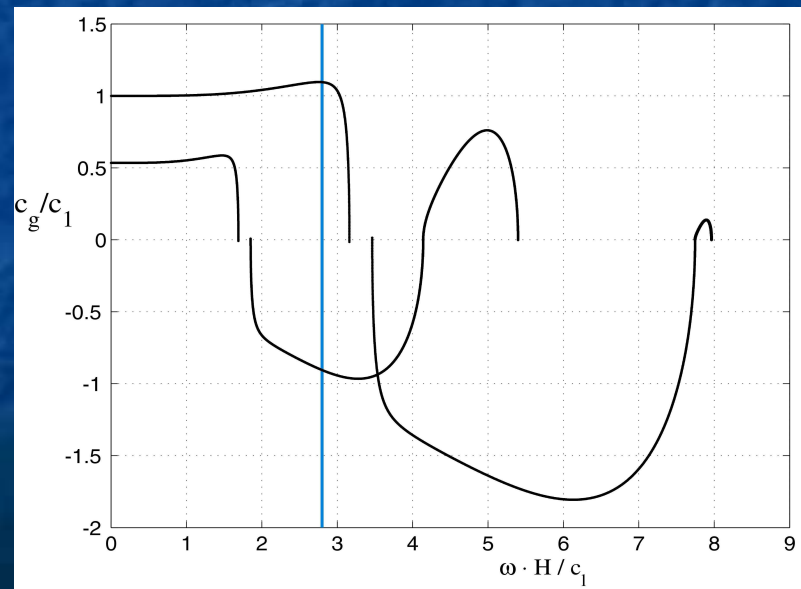
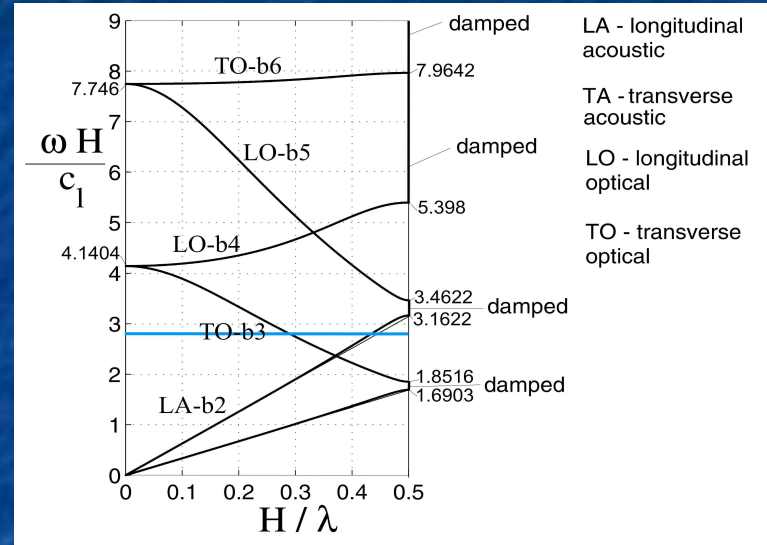
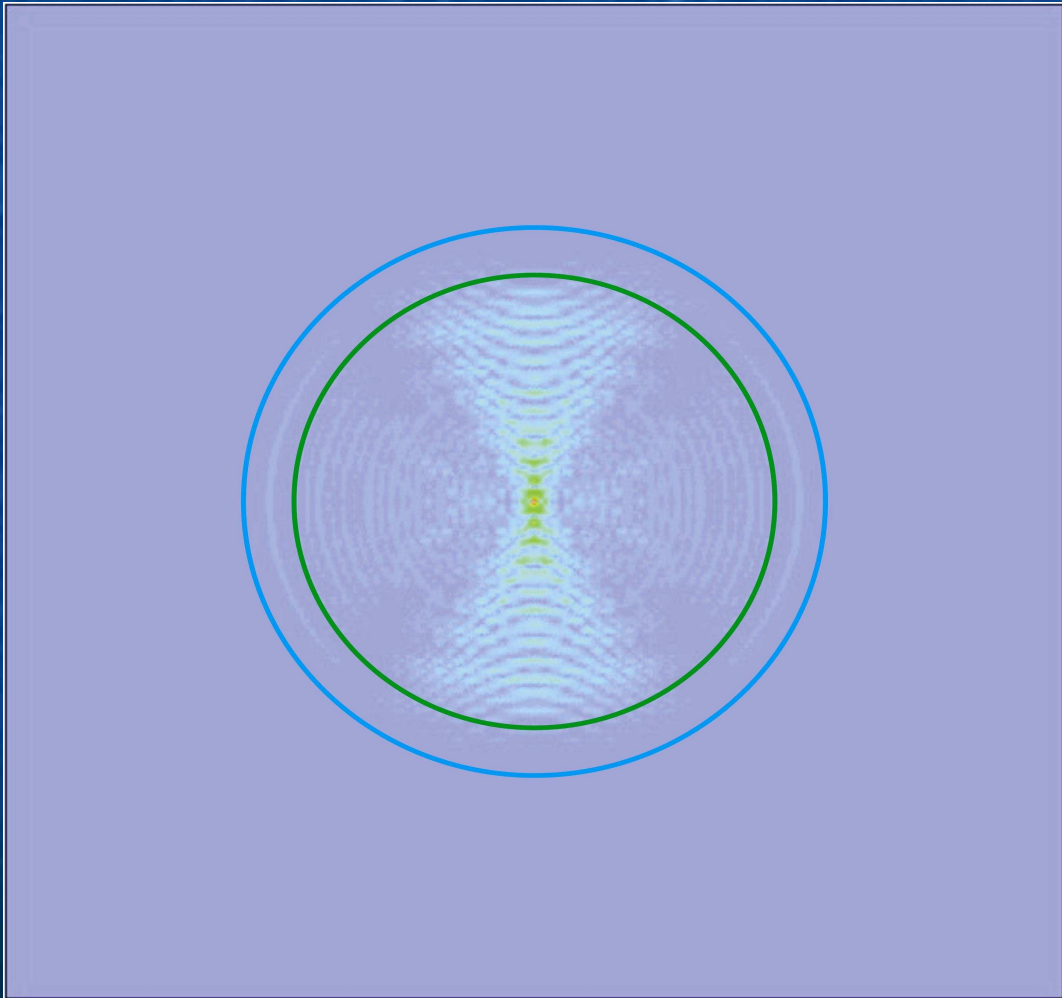
branch b2



branch b3



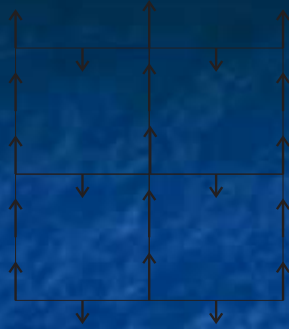
$$\omega H / c_1 = 2.8$$



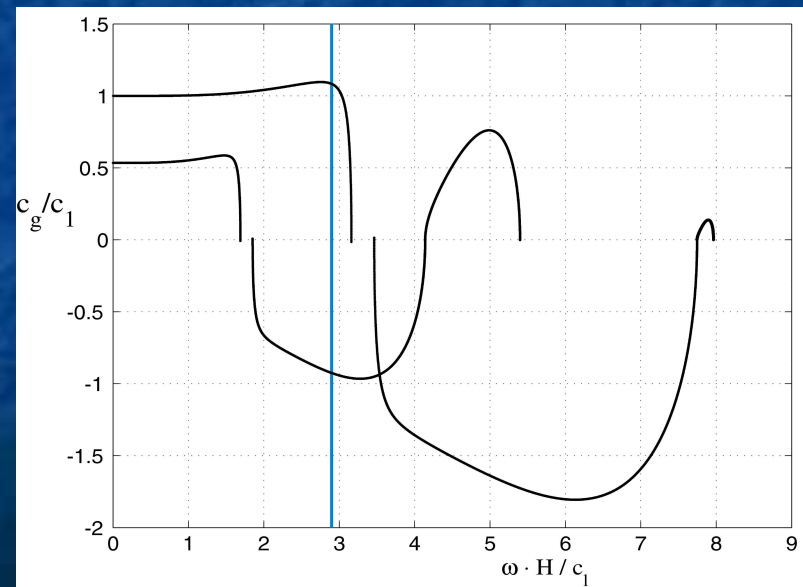
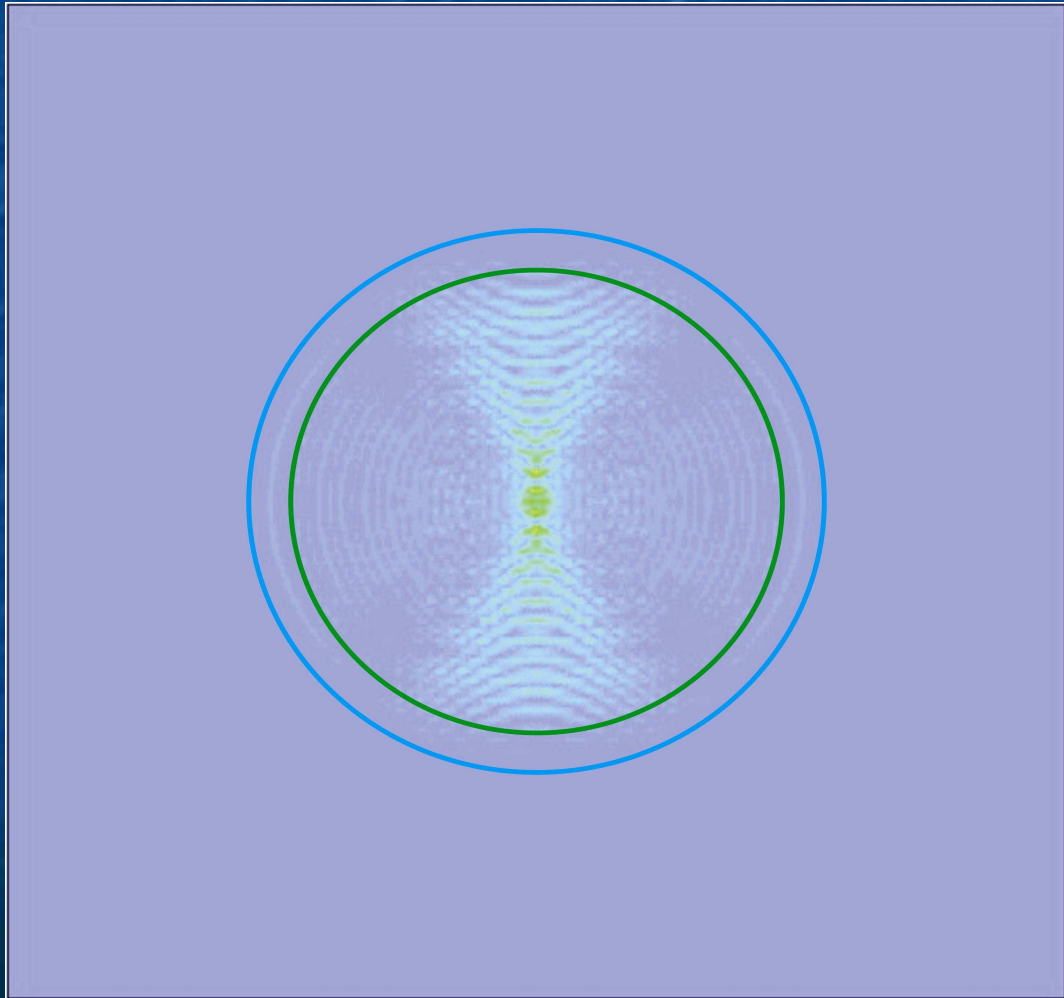
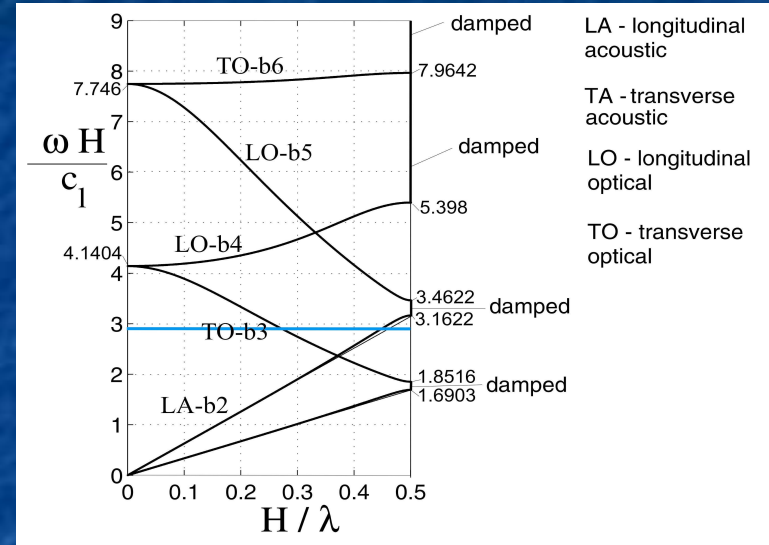
branch b2



branch b3



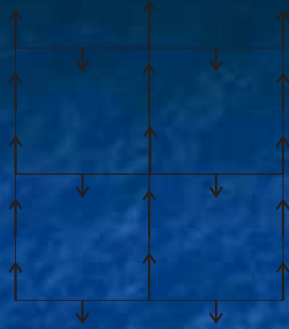
$$\omega H / c_1 = 2.9$$



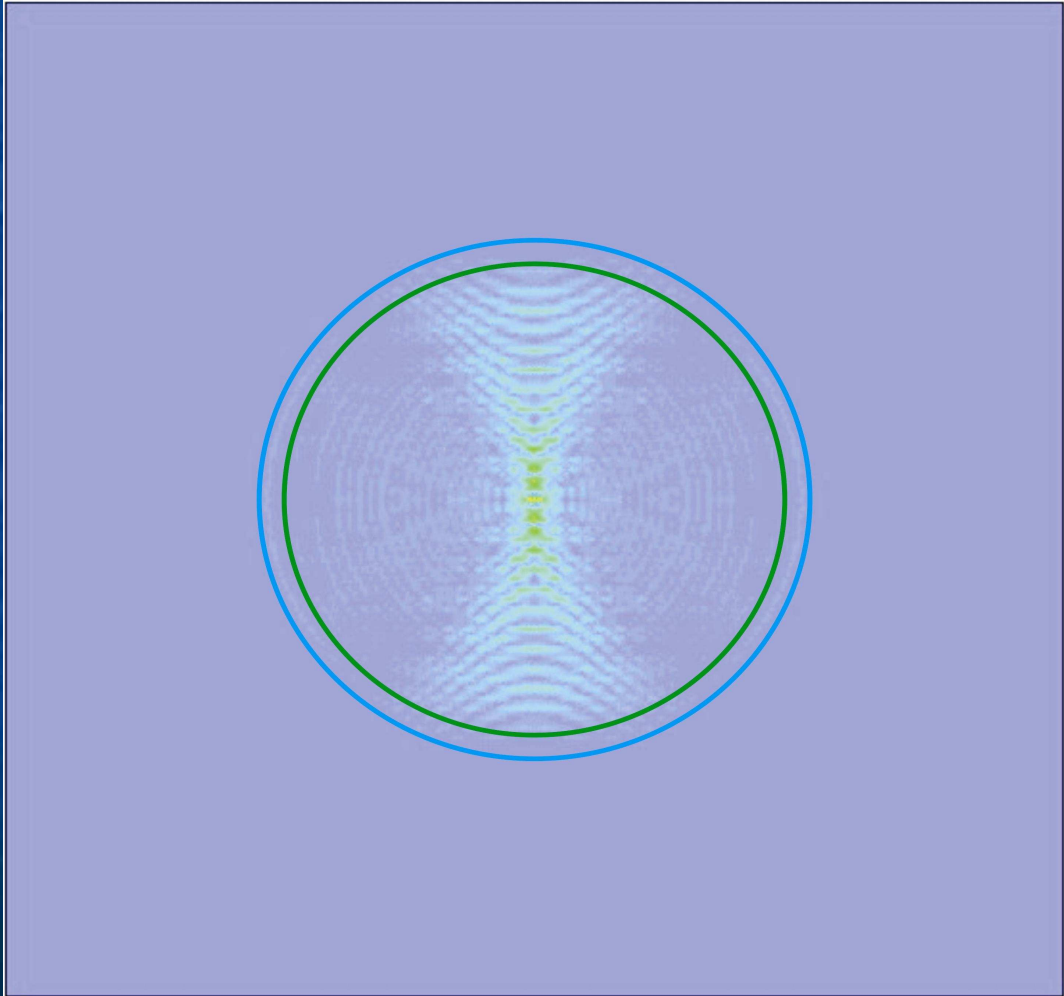
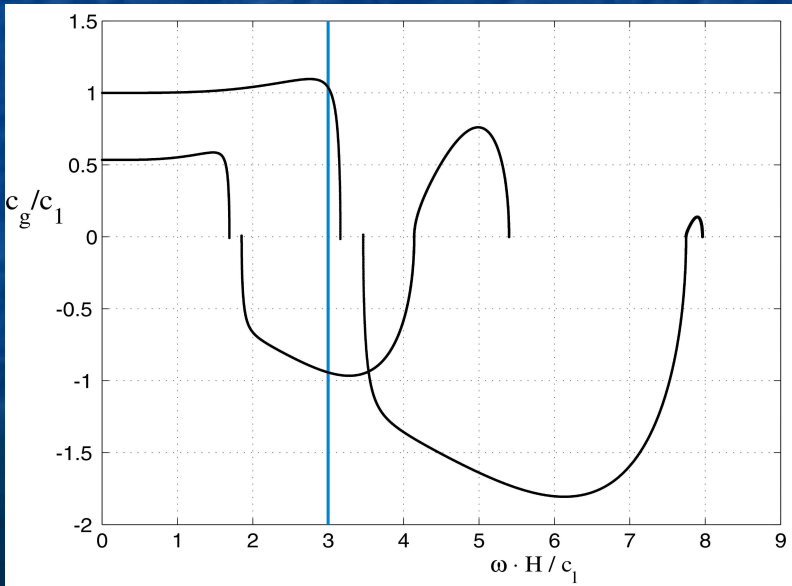
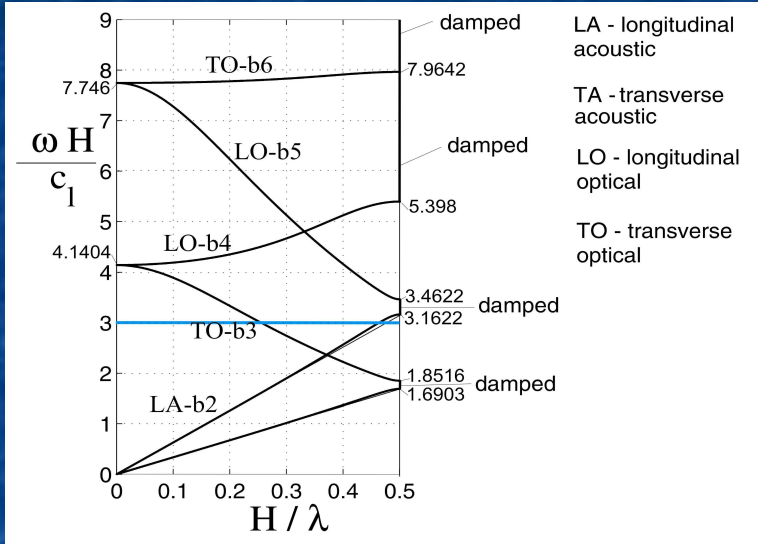
branch b2



branch b3



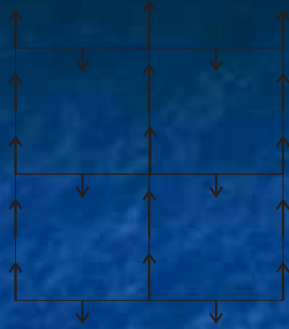
$$\omega H / c_1 = 3.0$$



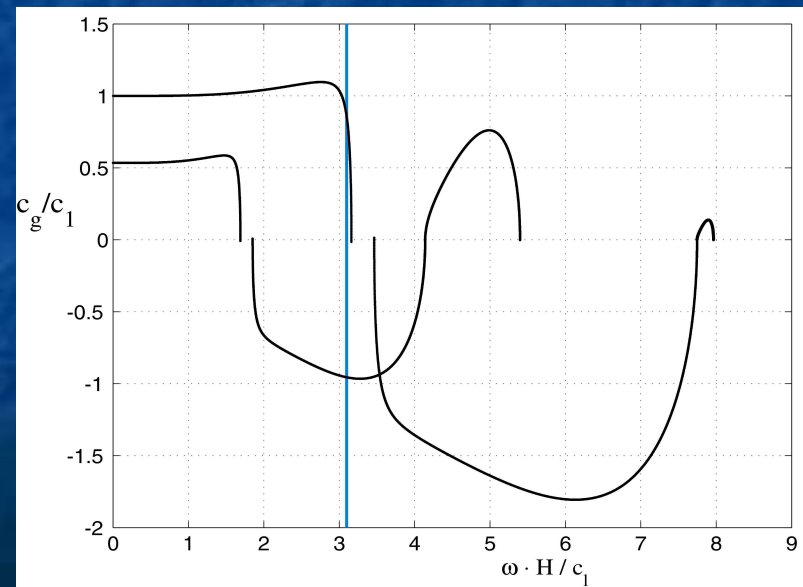
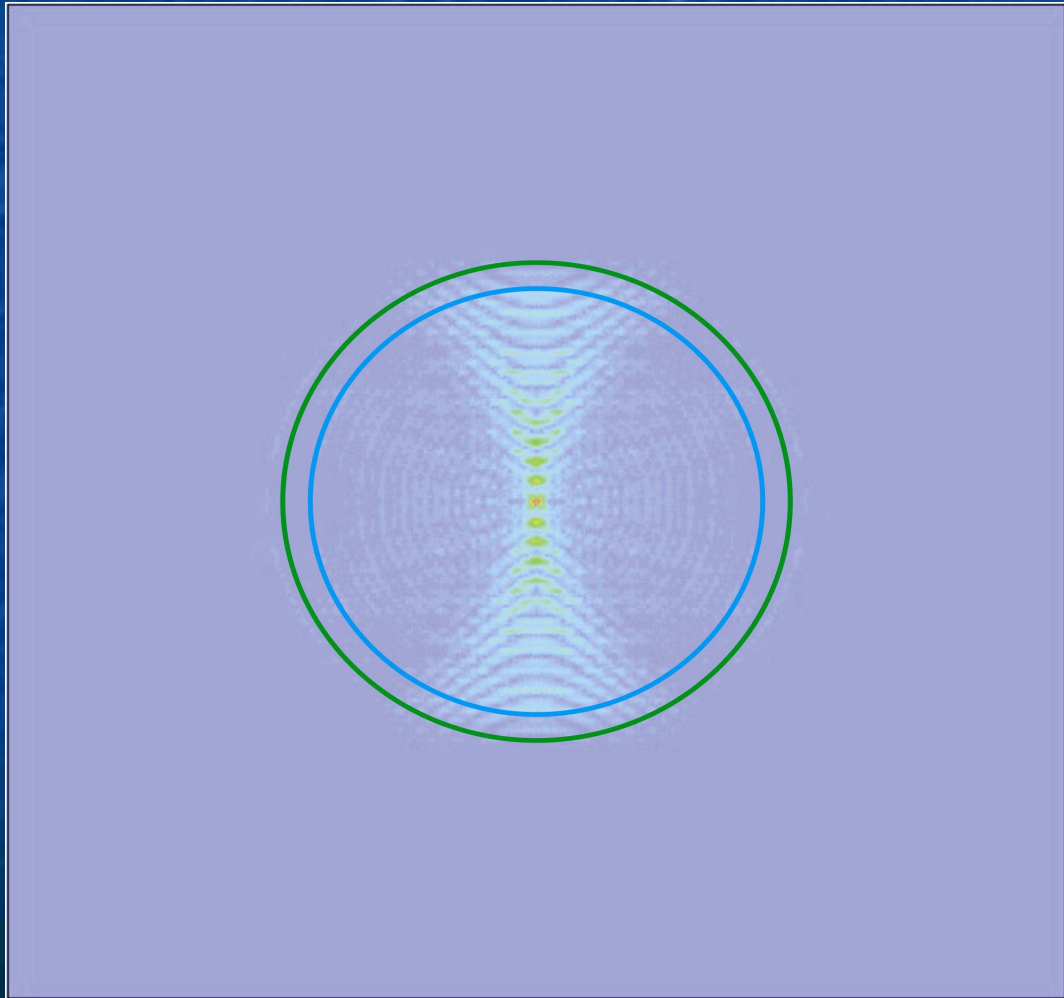
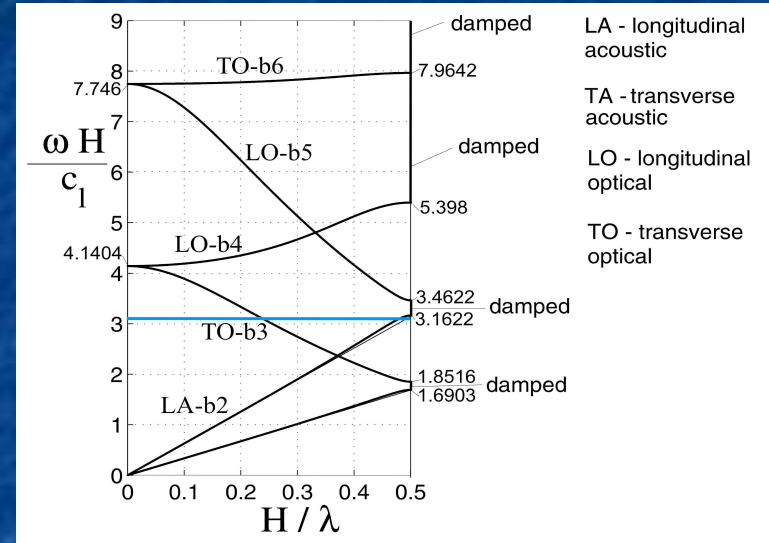
branch b2



branch b3

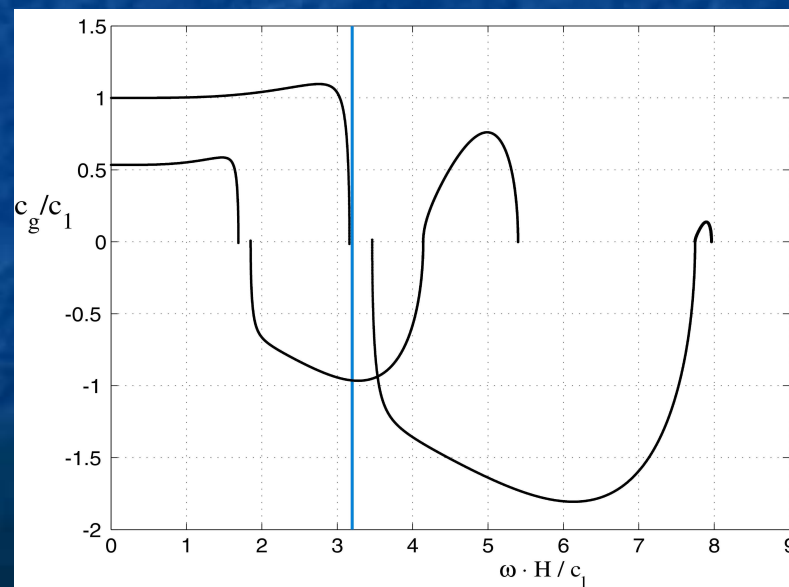
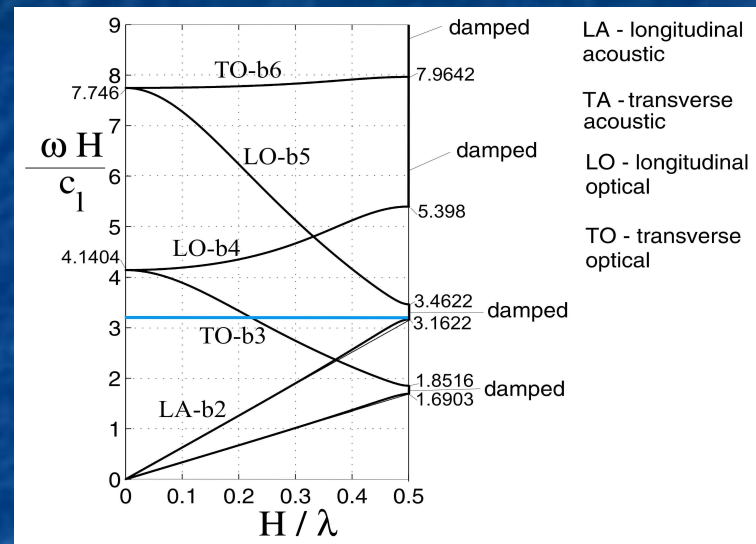
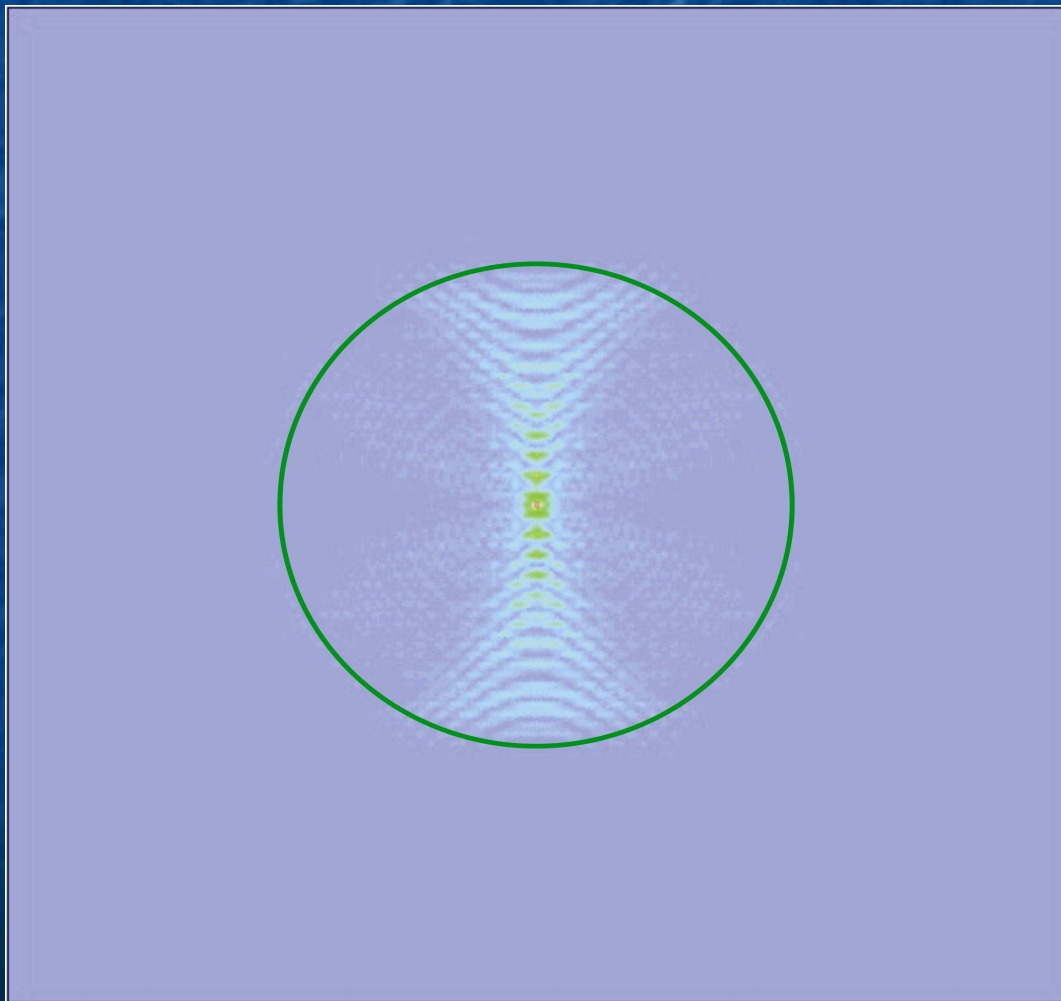


$$\omega H / c_1 = 3.1$$



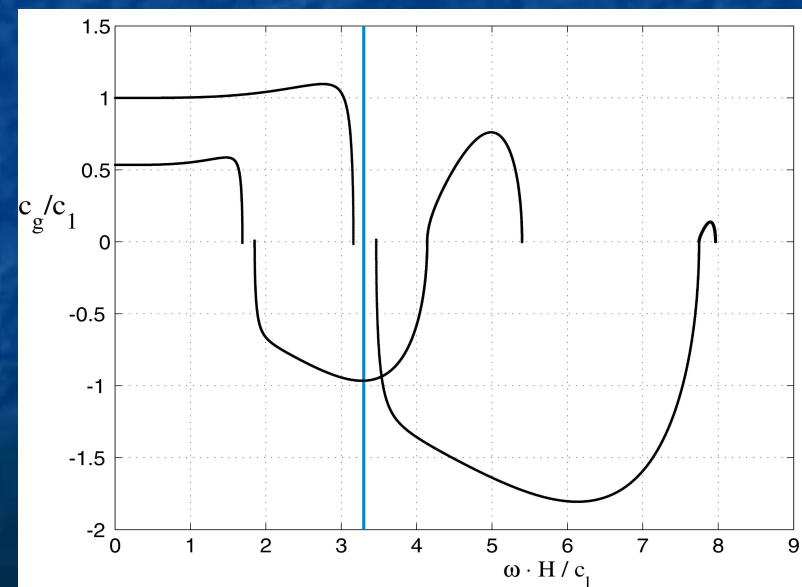
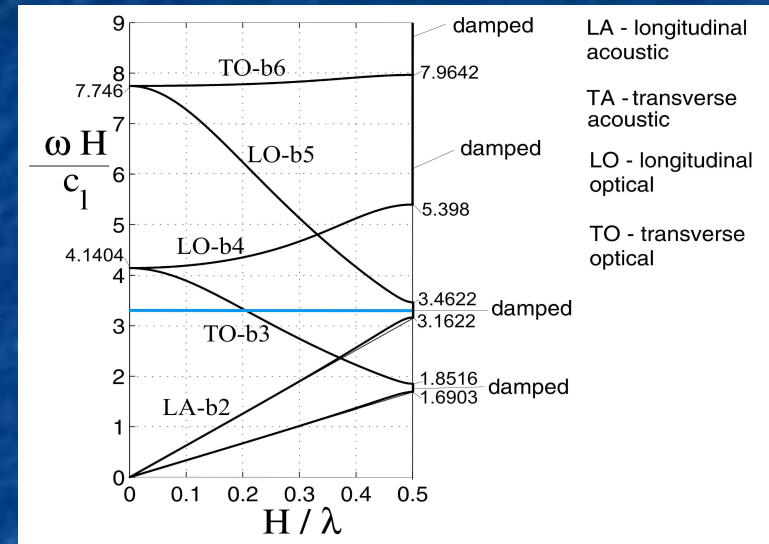
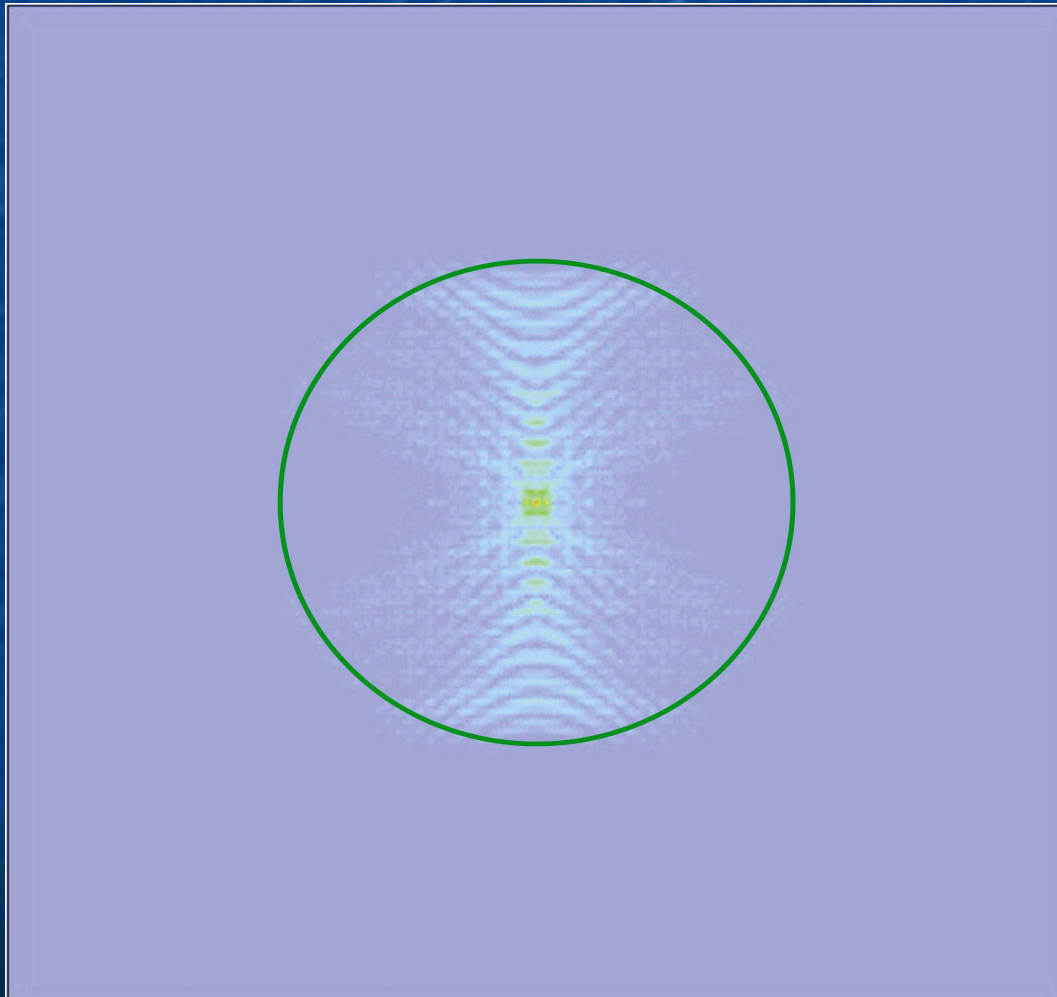


$$\omega H / c_1 = 3.2$$



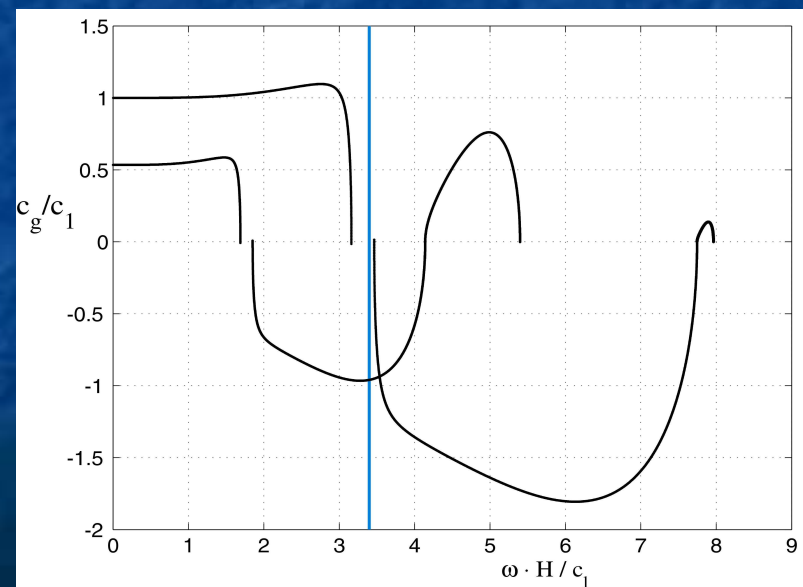
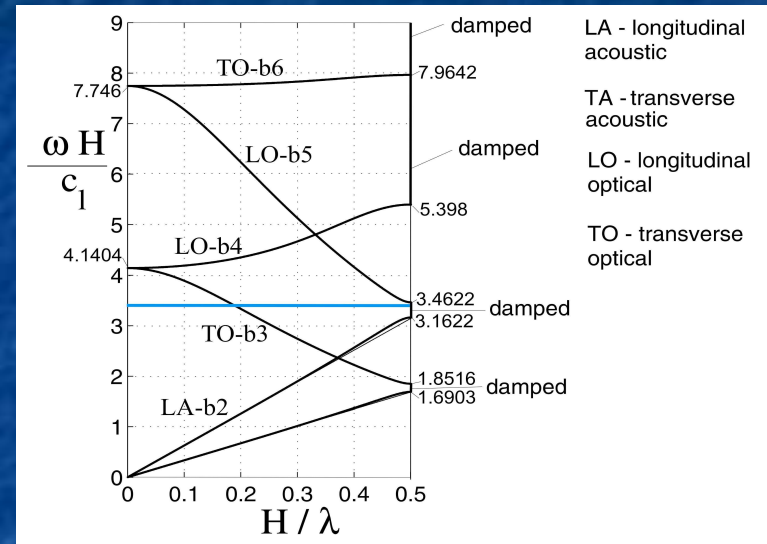
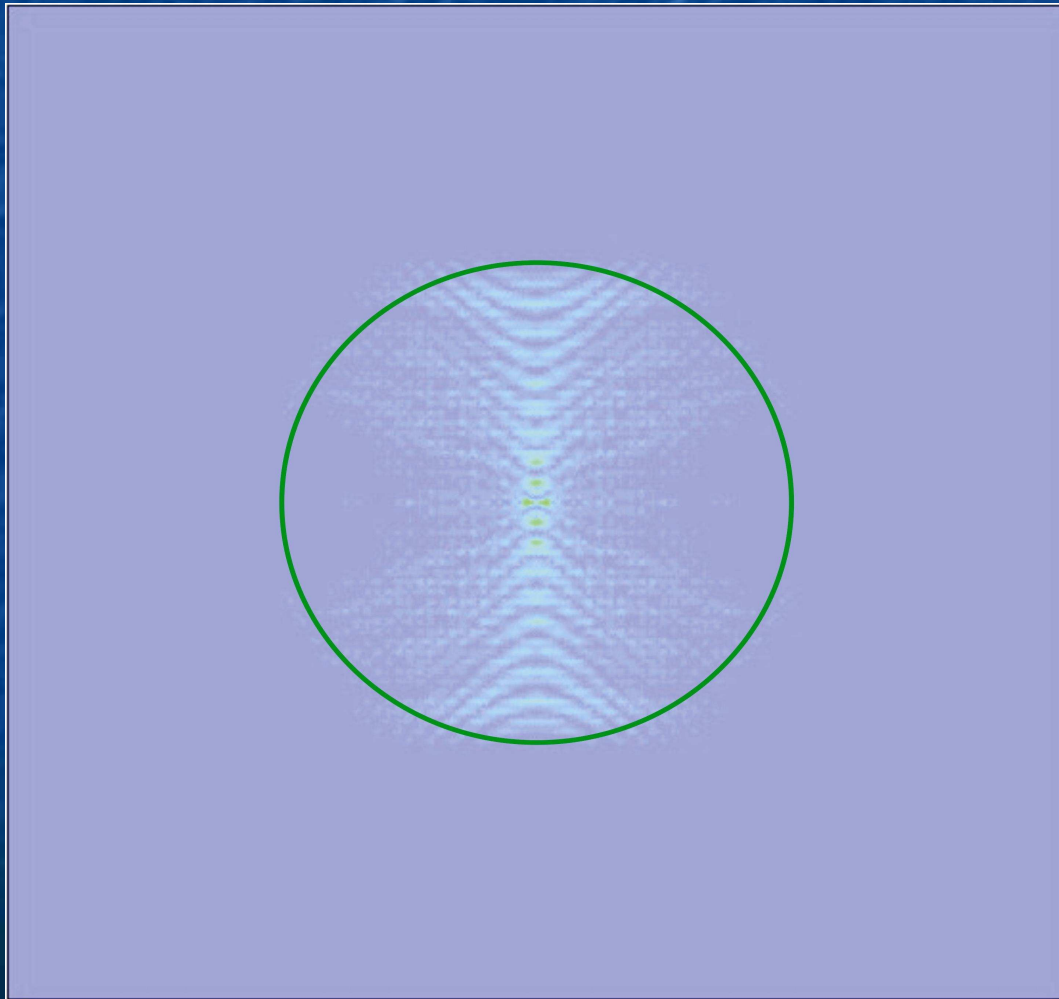


$$\omega H / c_1 = 3.3$$



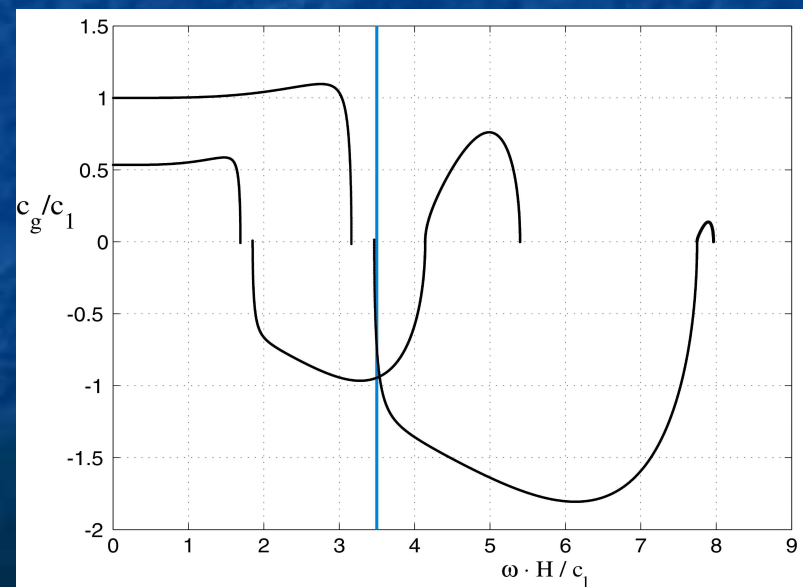
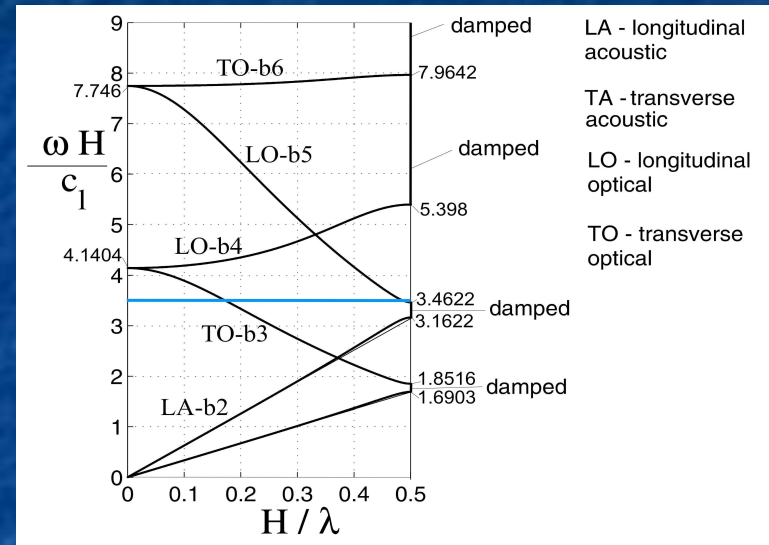
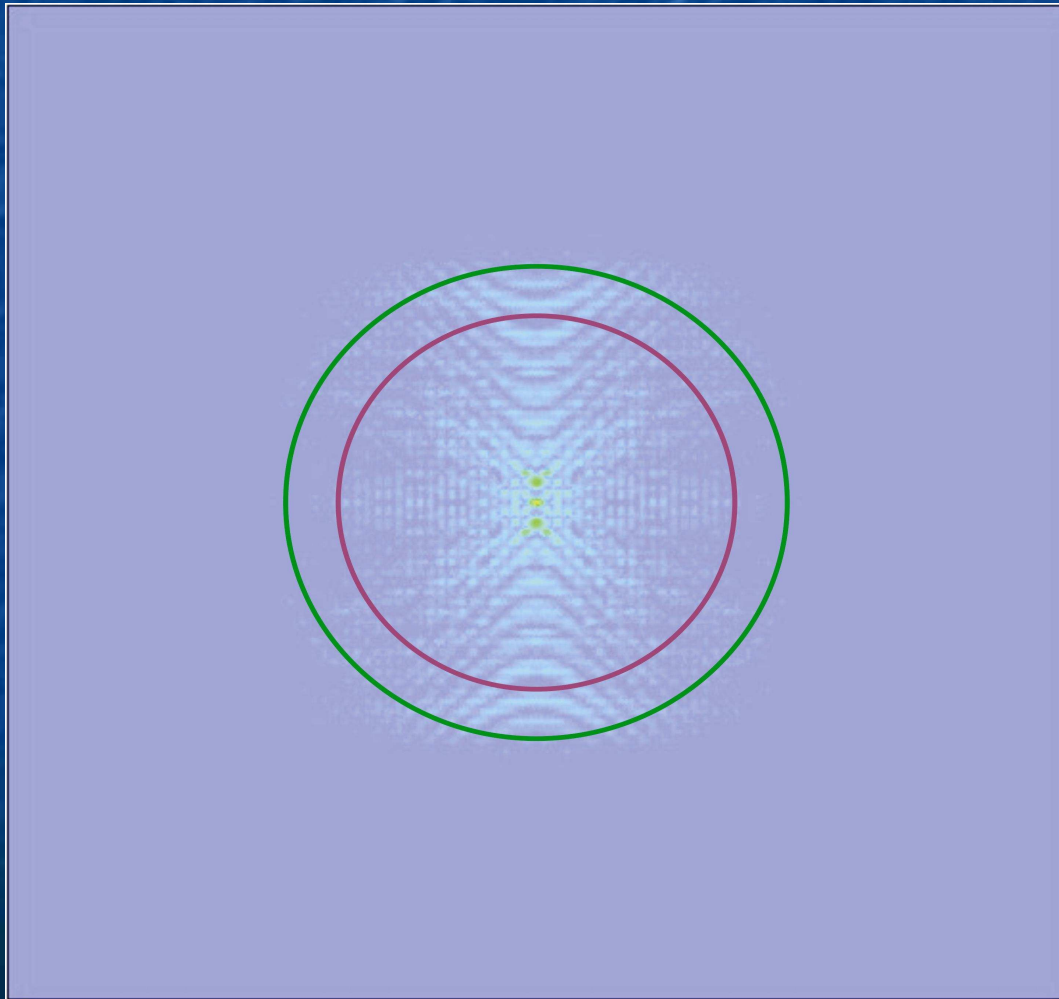


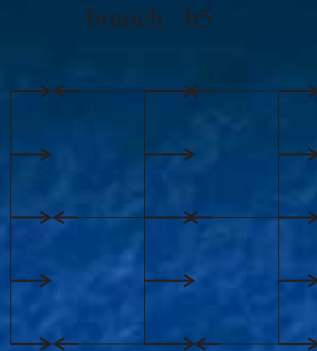
$$\omega H / c_1 = 3.4$$



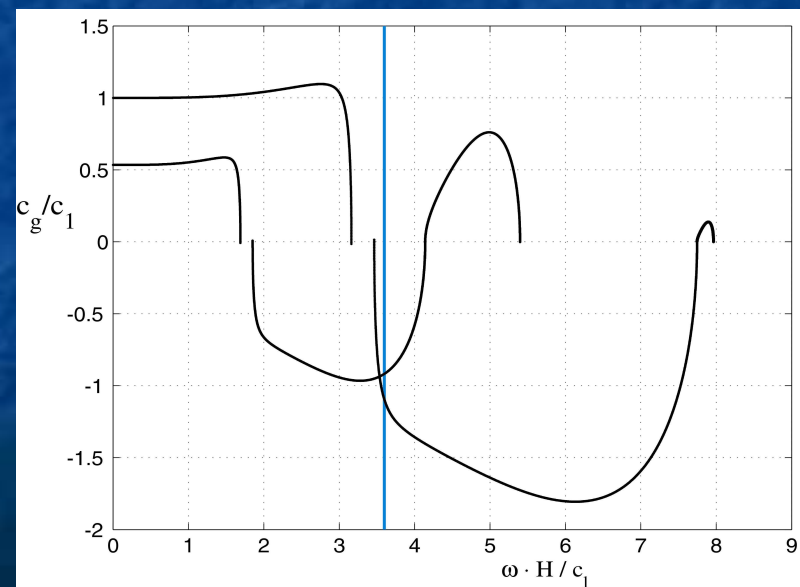
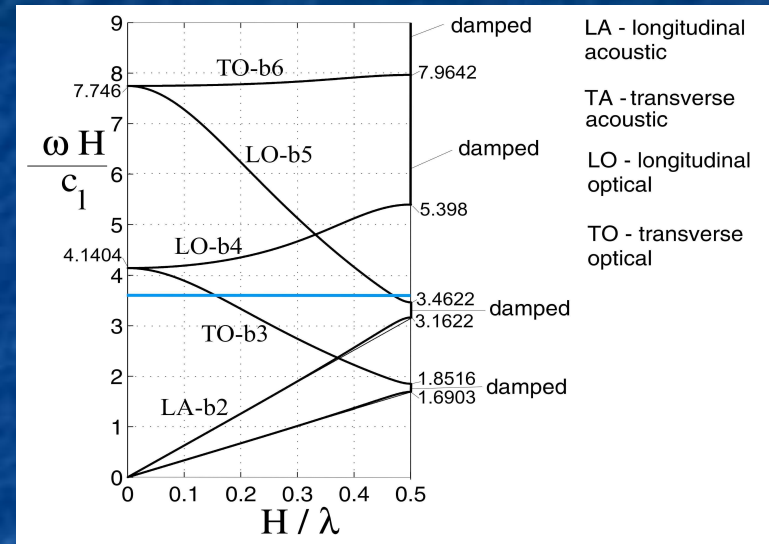
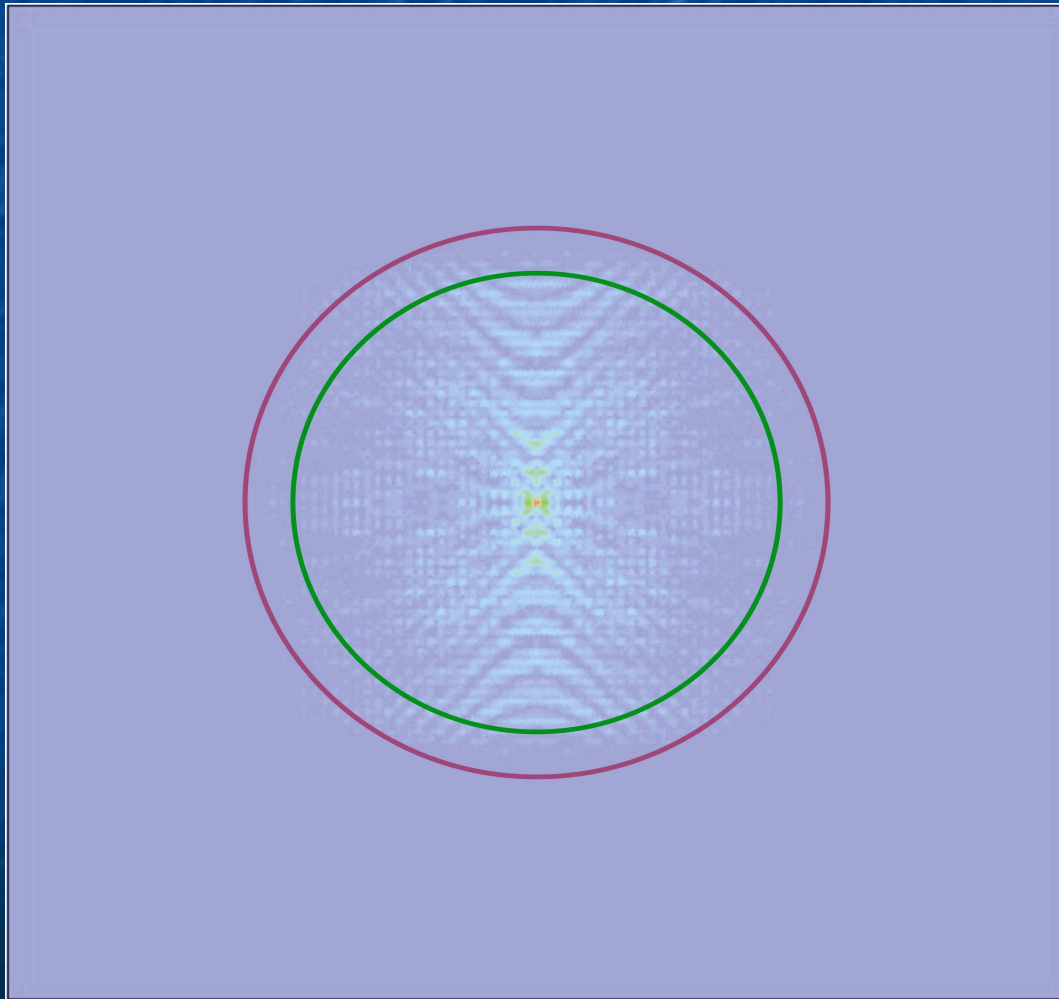


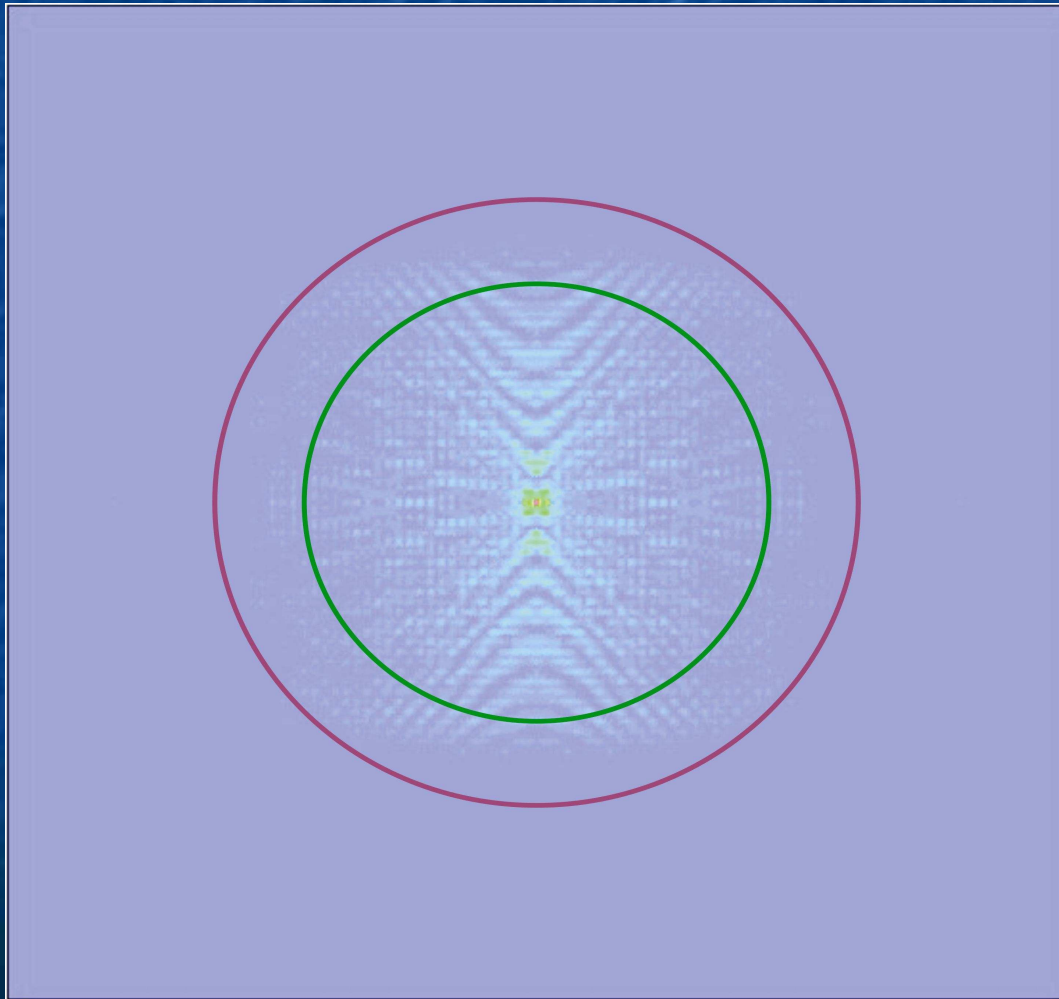
$$\omega H / c_1 = 3.5$$



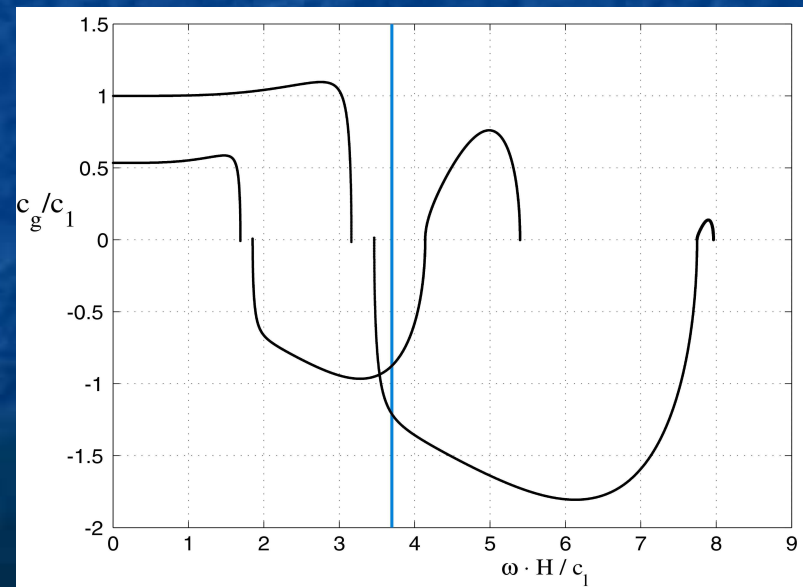
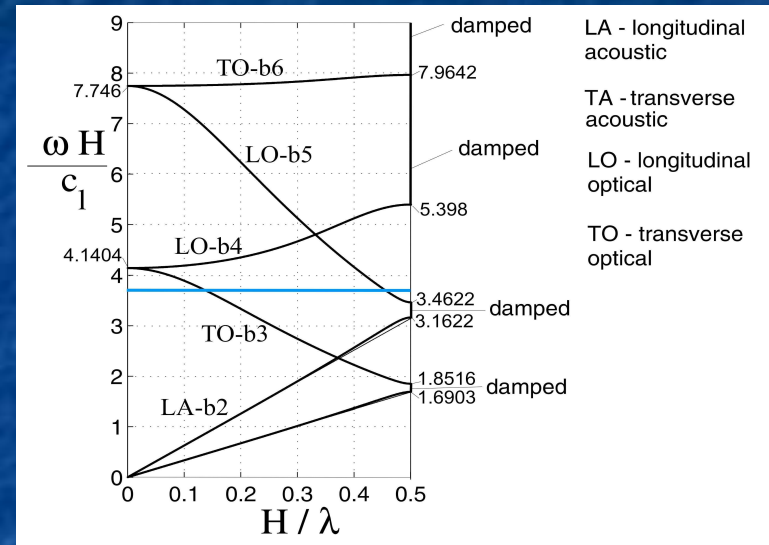


$$\omega H / c_1 = 3.6$$



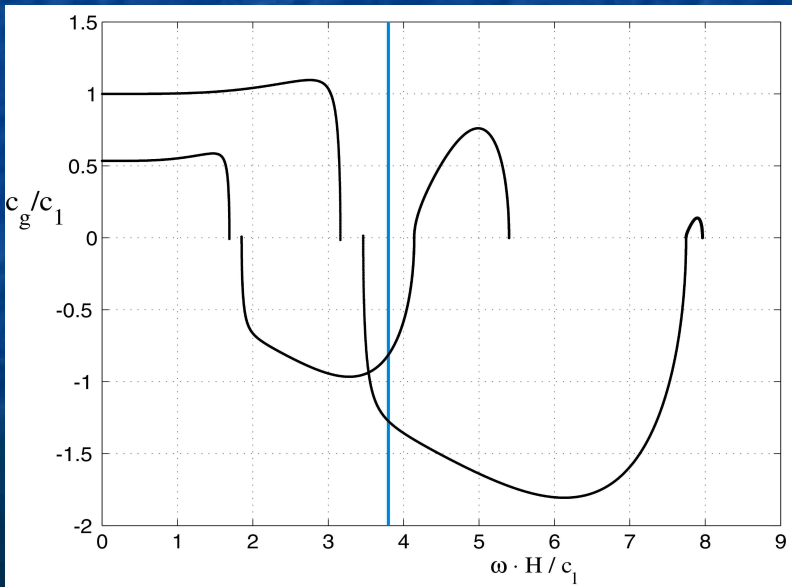
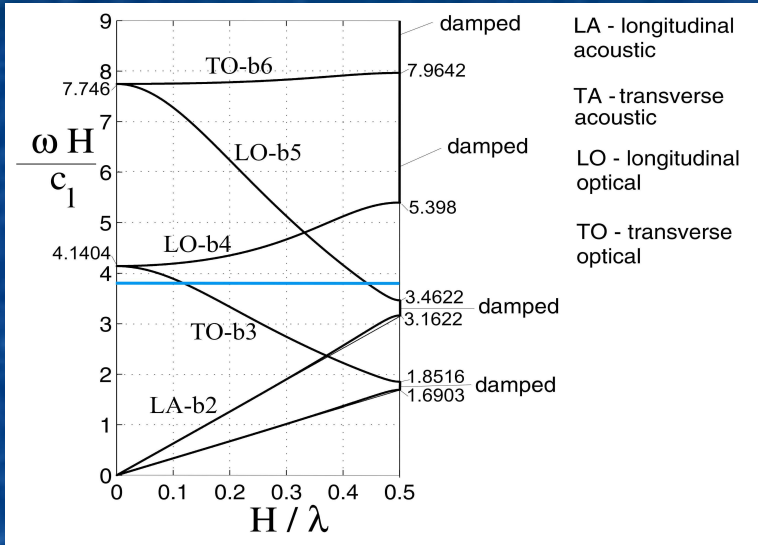
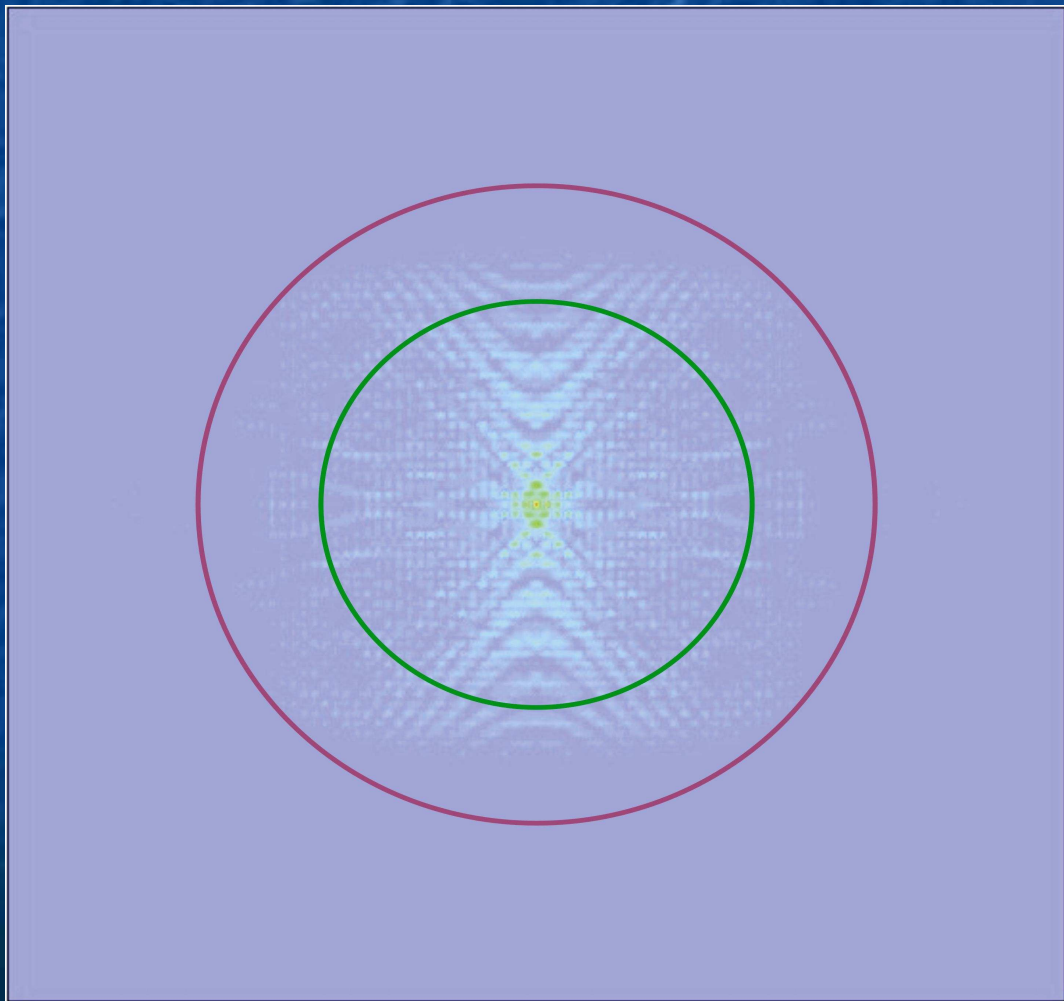


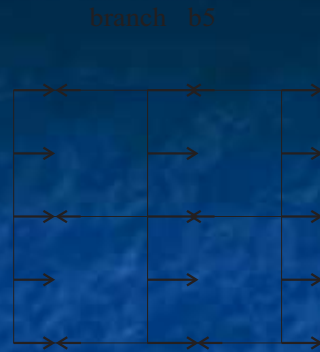
$$\omega H / c_1 = 3.7$$



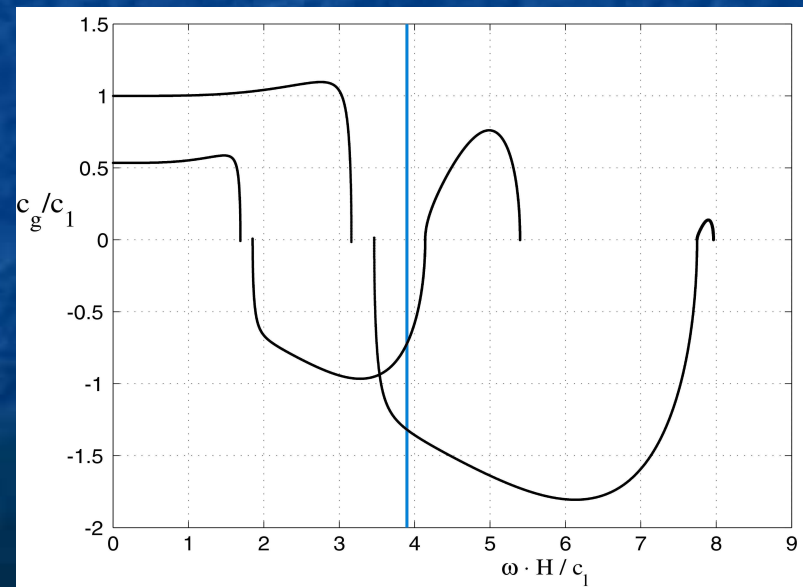
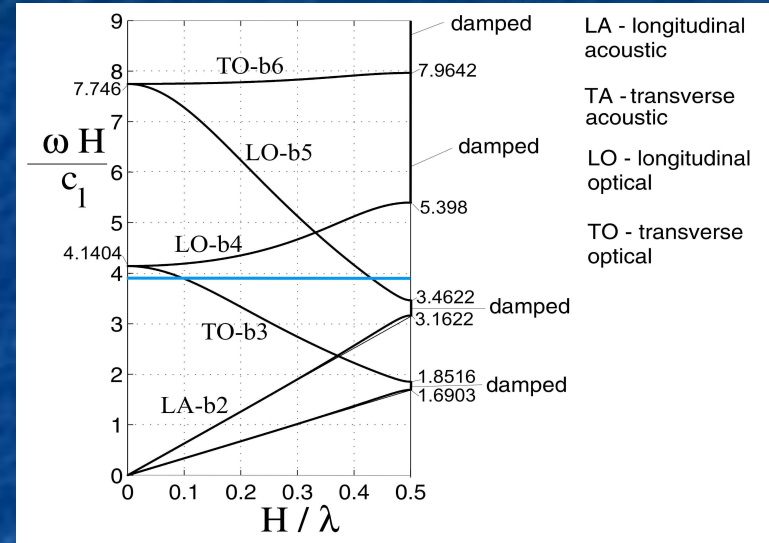
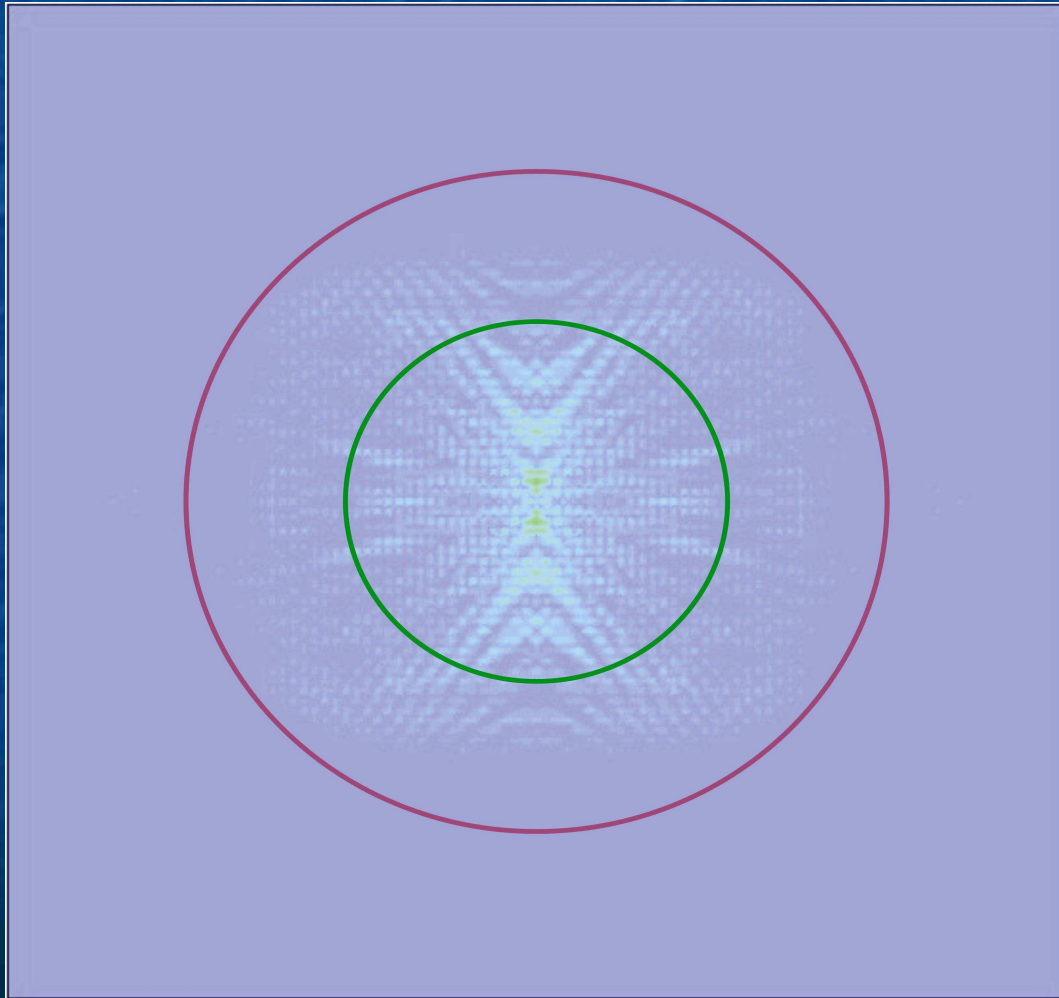


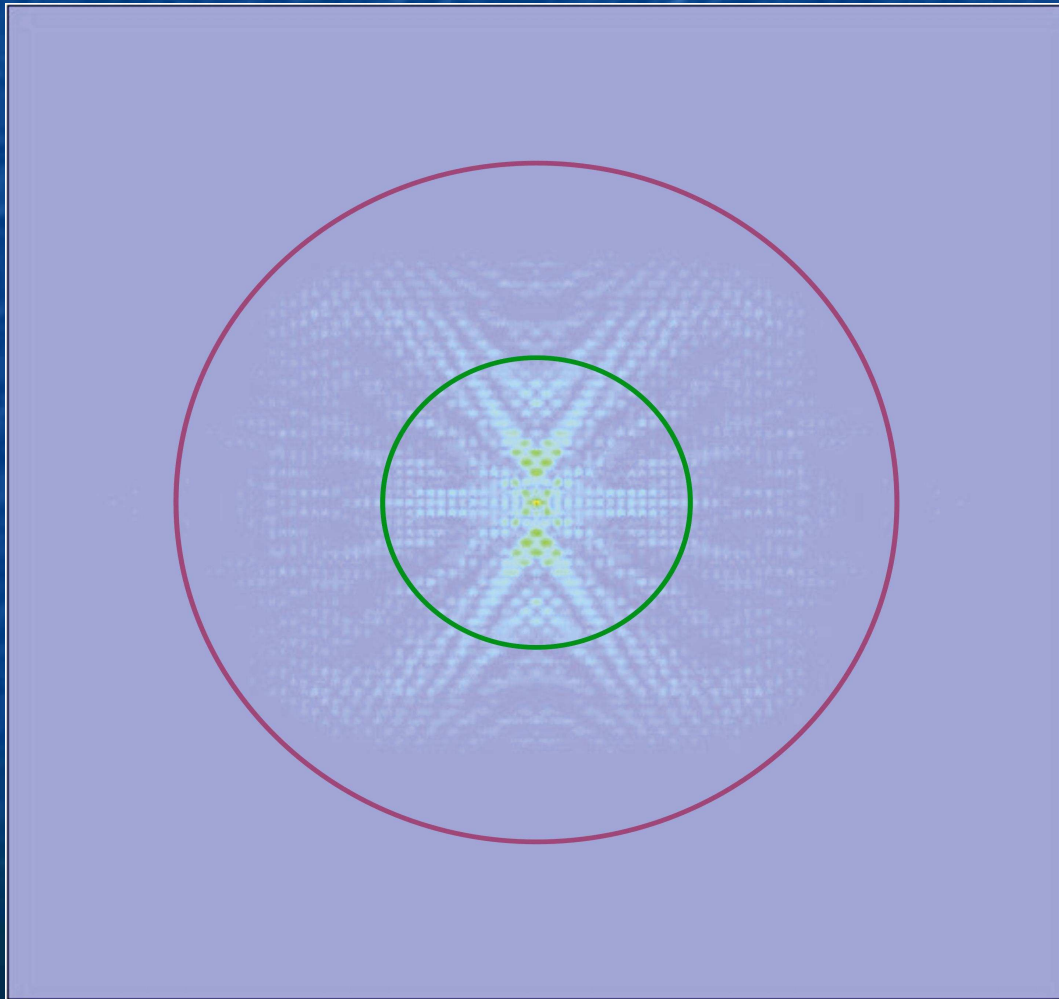
$$\omega H / c_1 = 3.8$$



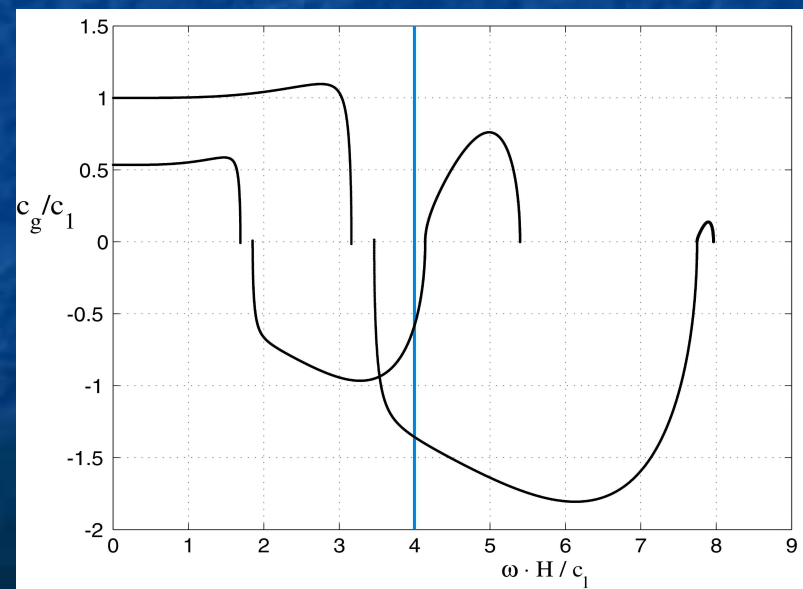
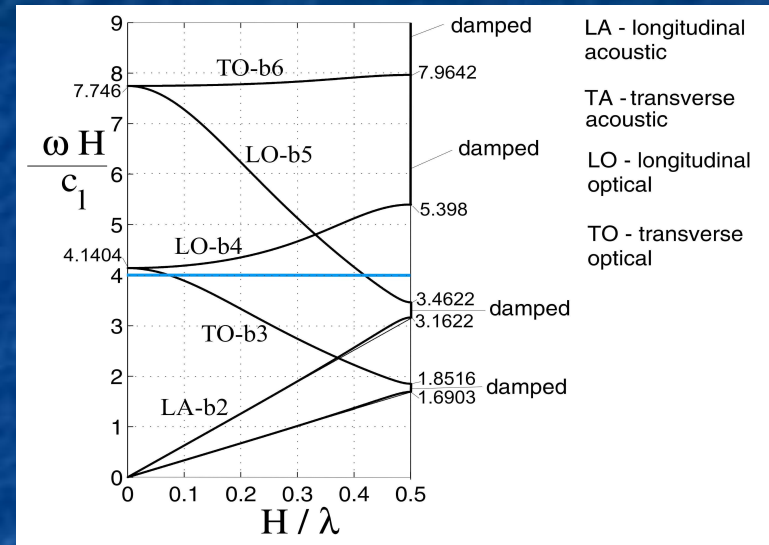


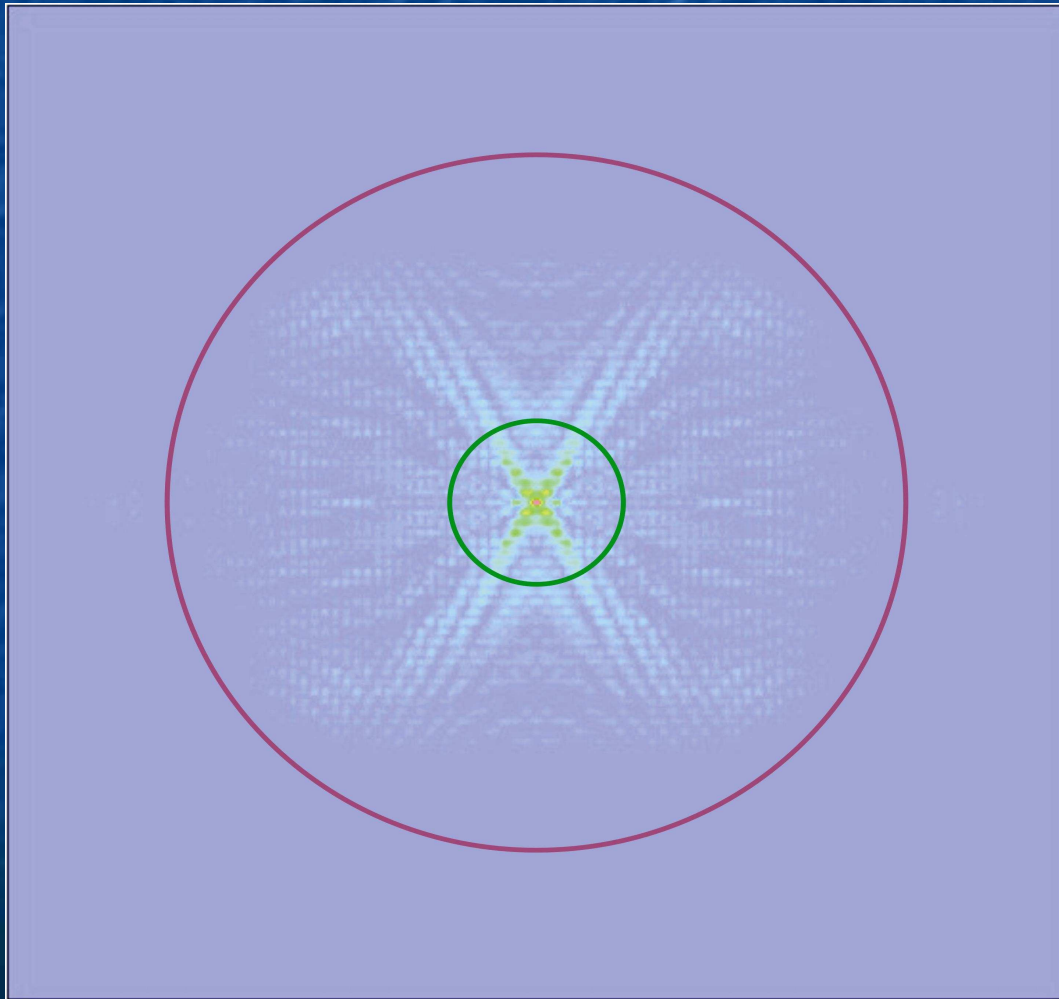
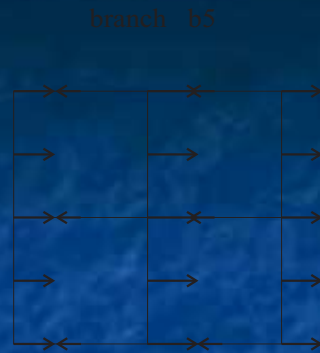
$$\omega H / c_1 = 3.9$$



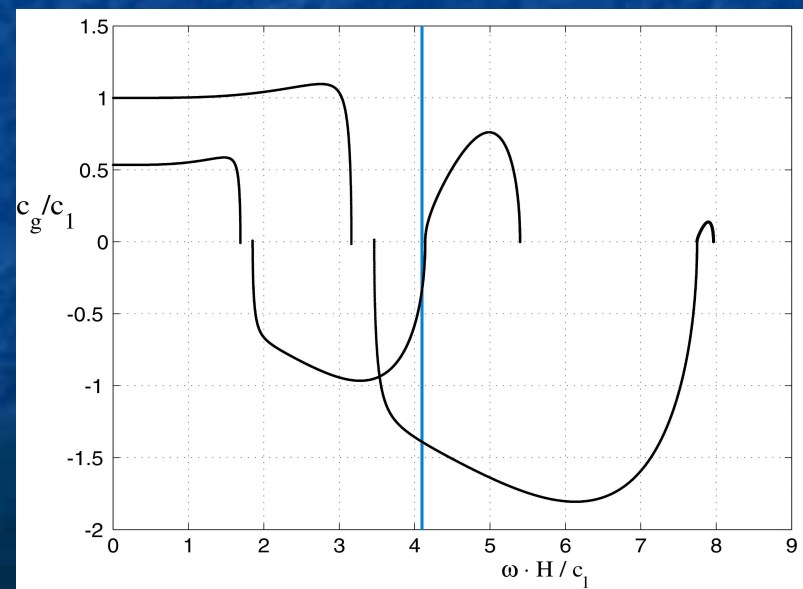
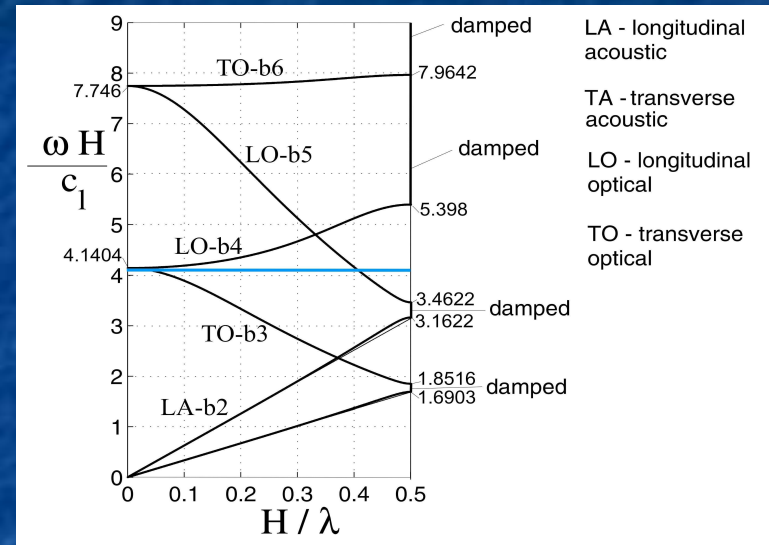


$$\omega H / c_1 = 4.0$$





$$\omega H / c_1 = 4.1$$



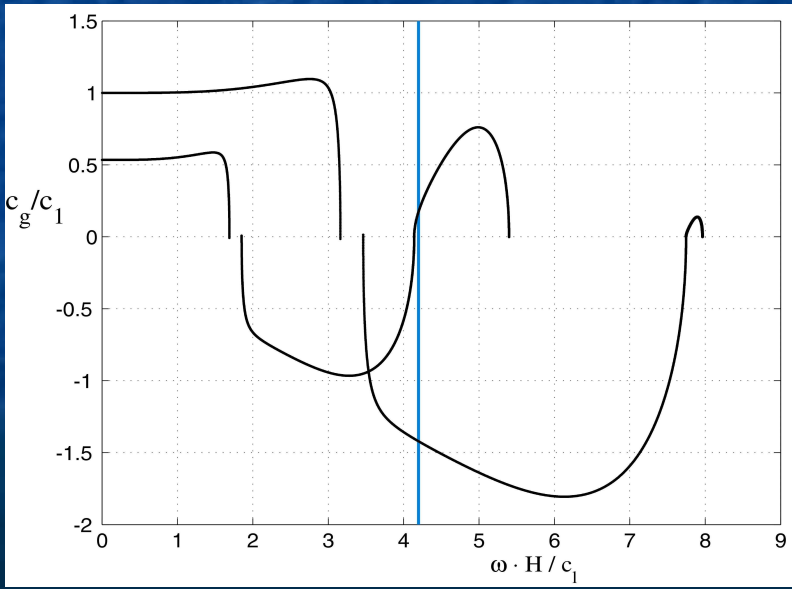
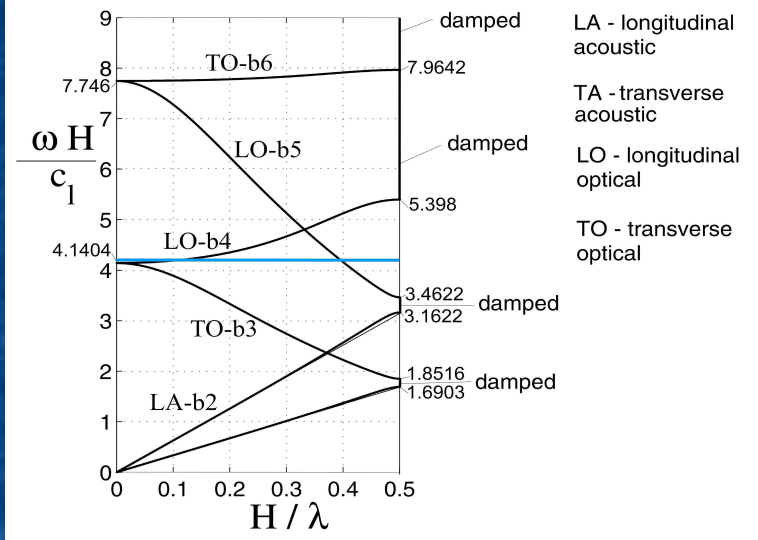
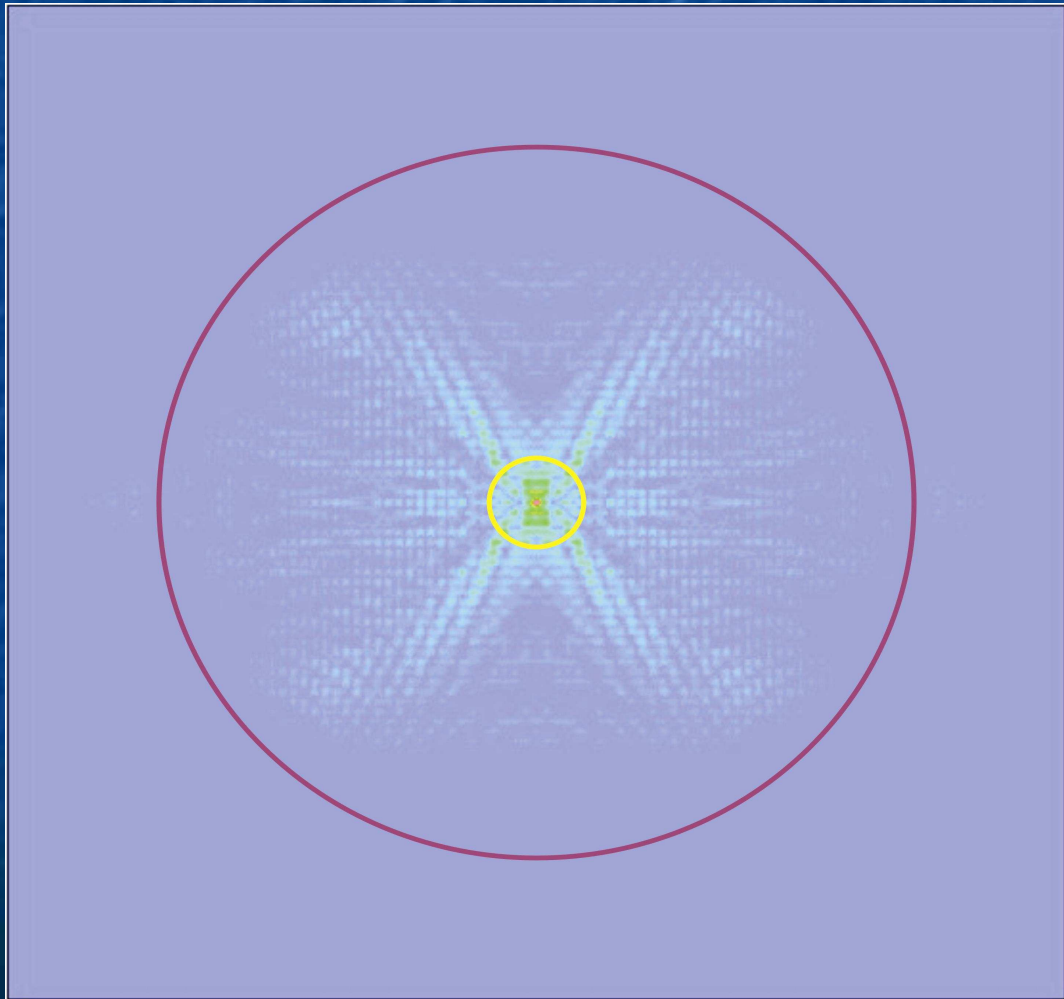
branch b4



branch b5



$$\omega H / c_1 = 4.2$$



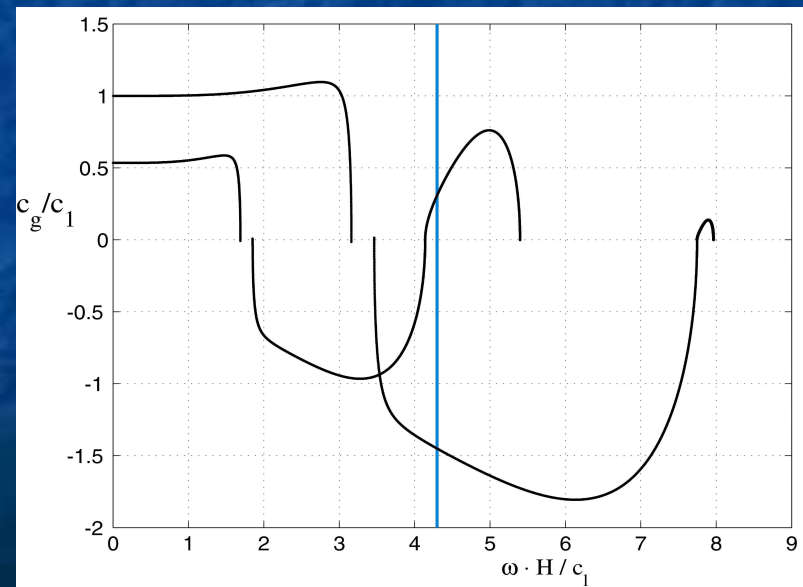
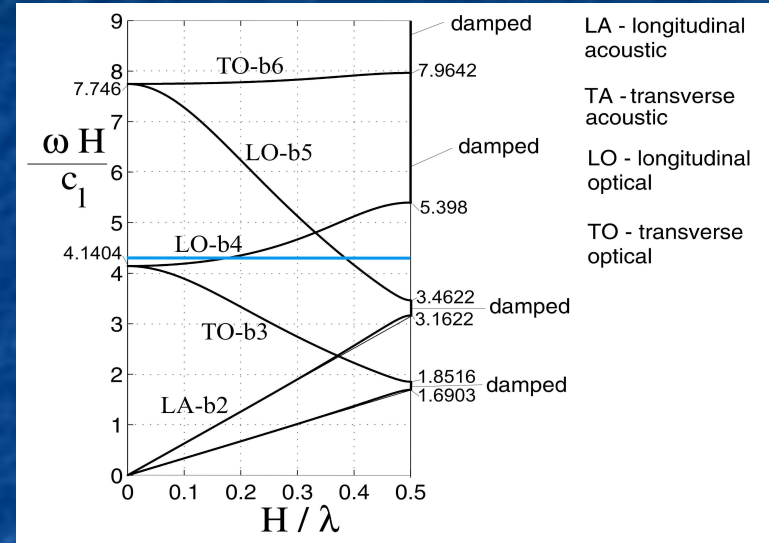
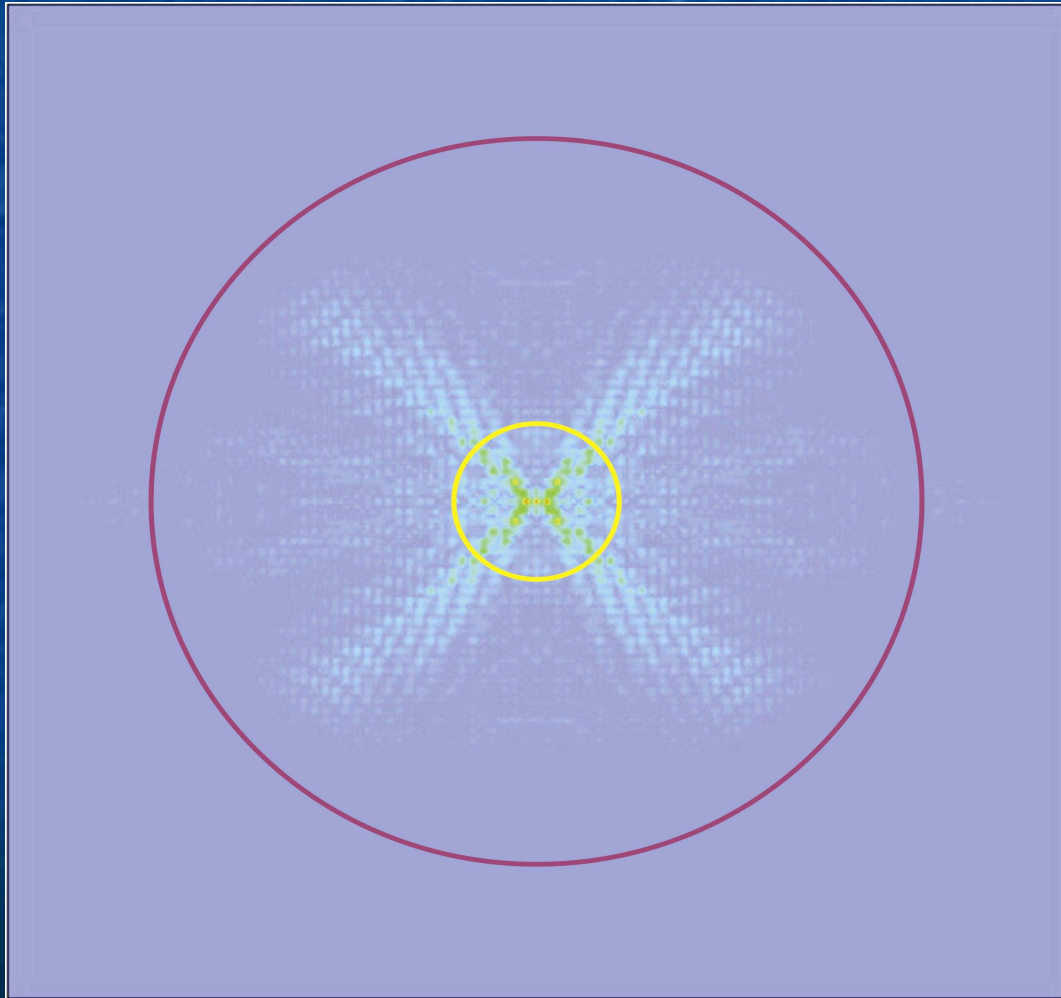
branch b4



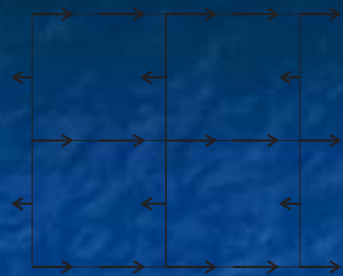
branch b5



$$\omega H / c_1 = 4.3$$



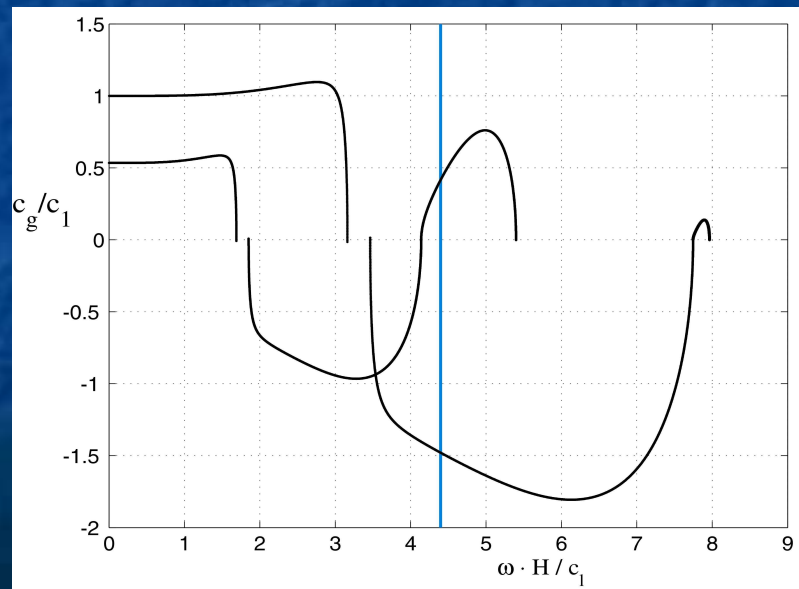
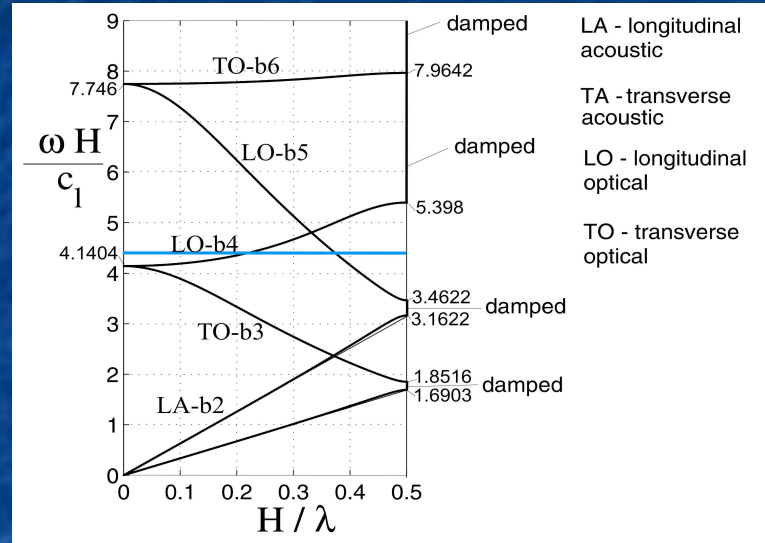
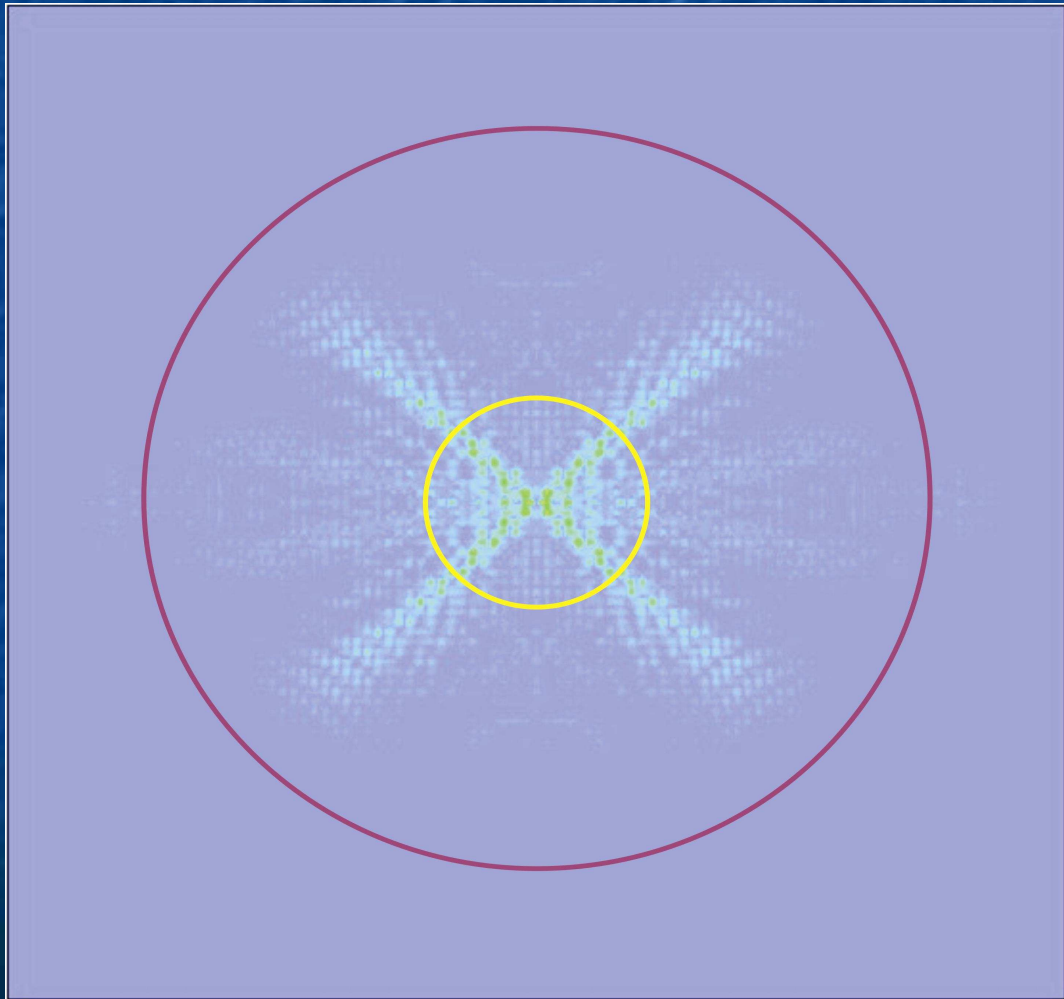
branch b4



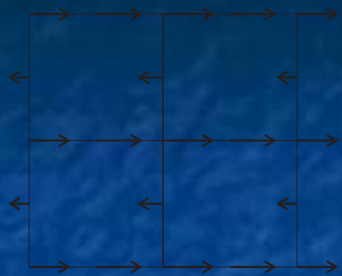
branch b5



$$\omega H / c_1 = 4.4$$



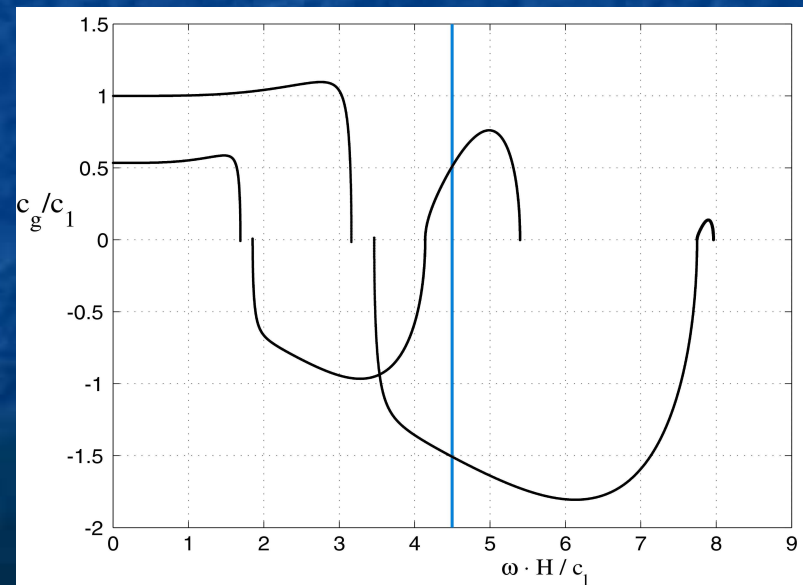
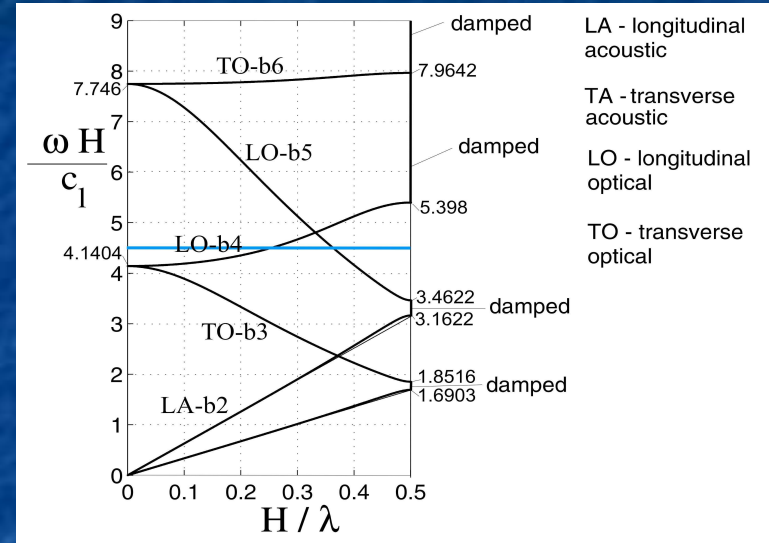
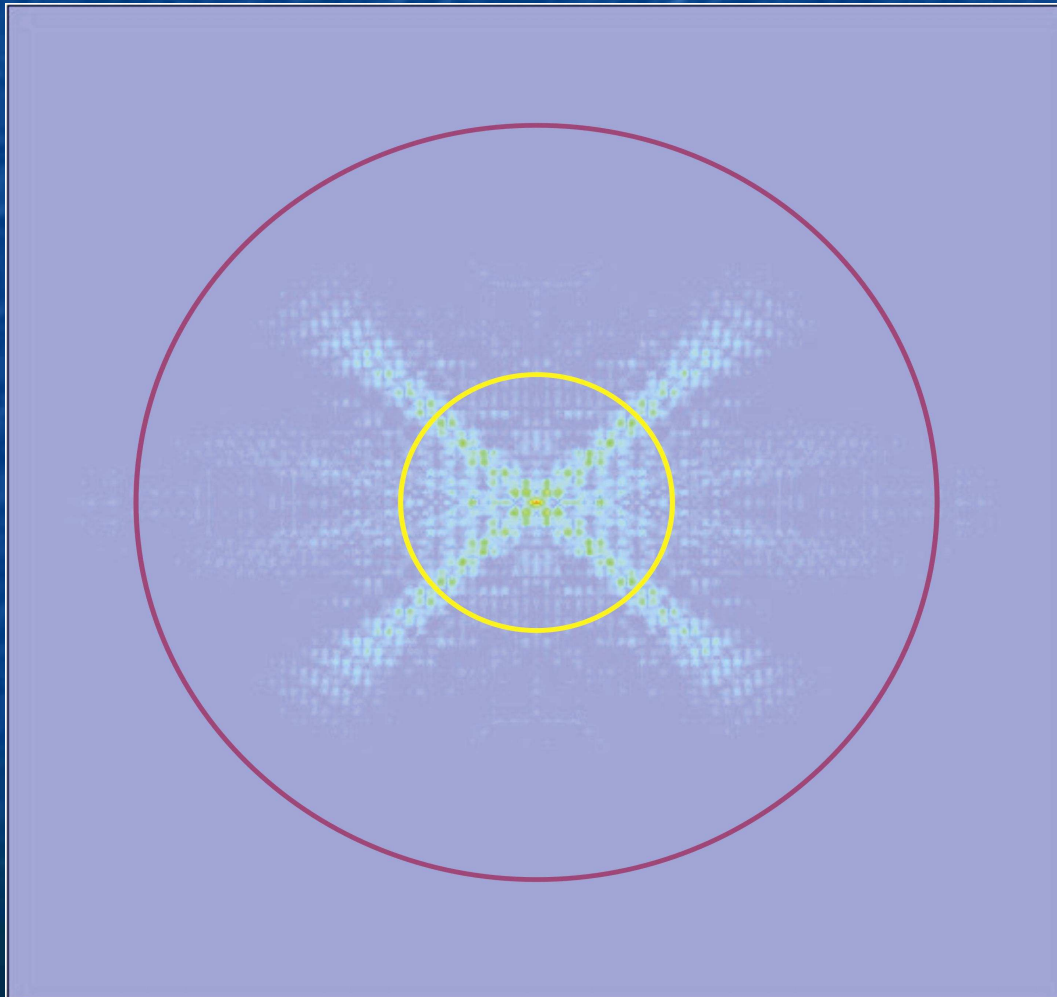
branch b4



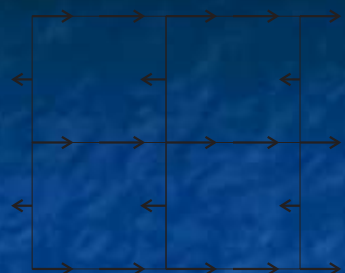
branch b5



$$\omega H / c_1 = 4.5$$



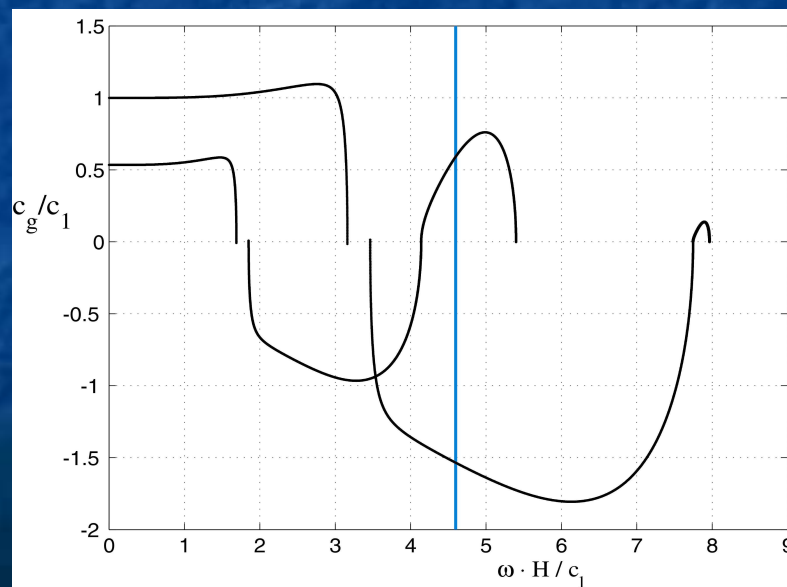
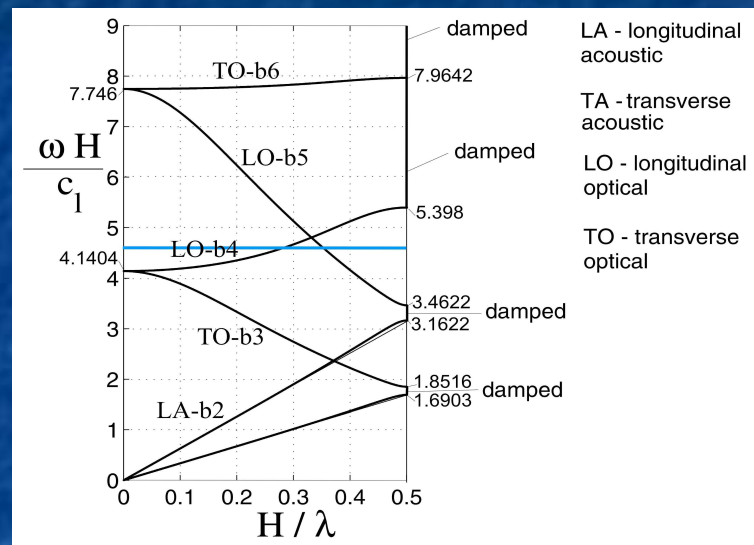
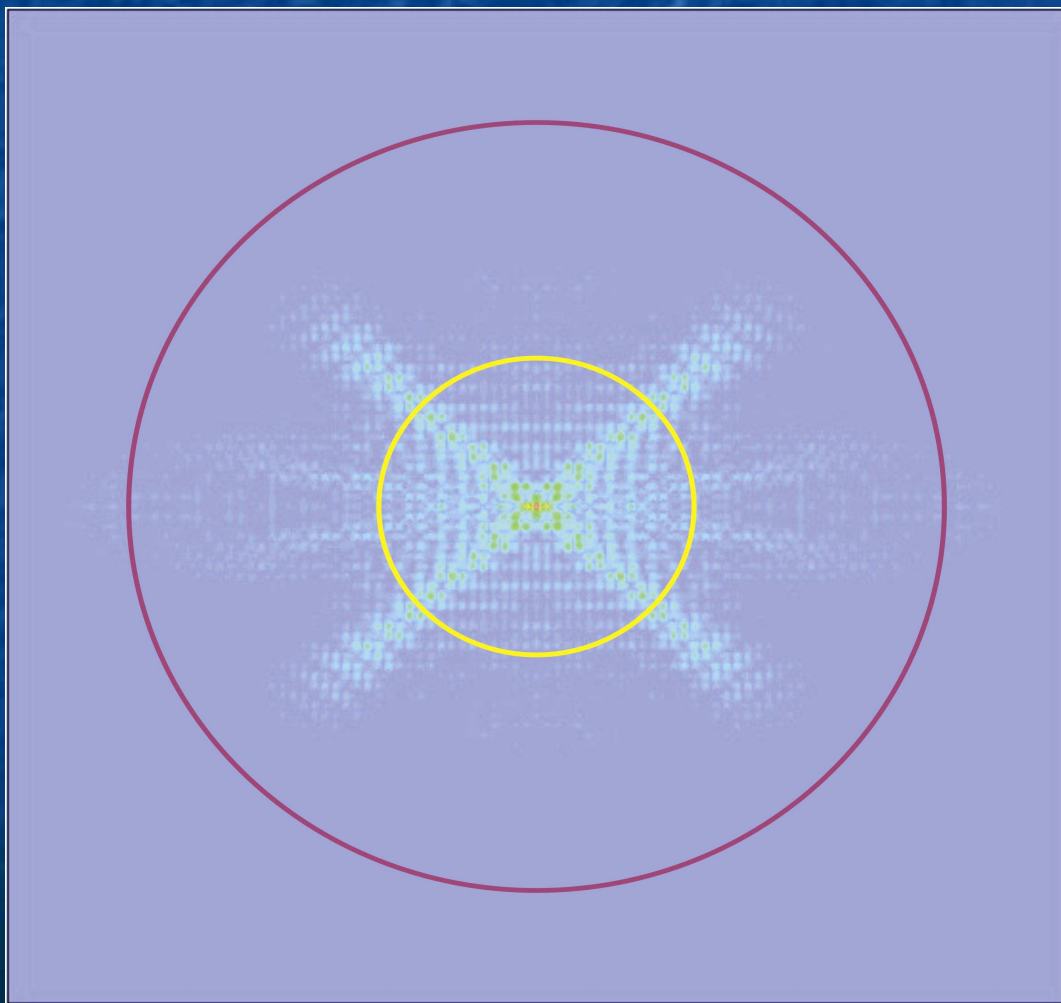
branch b4



branch b5



$$\omega H / c_1 = 4.6$$



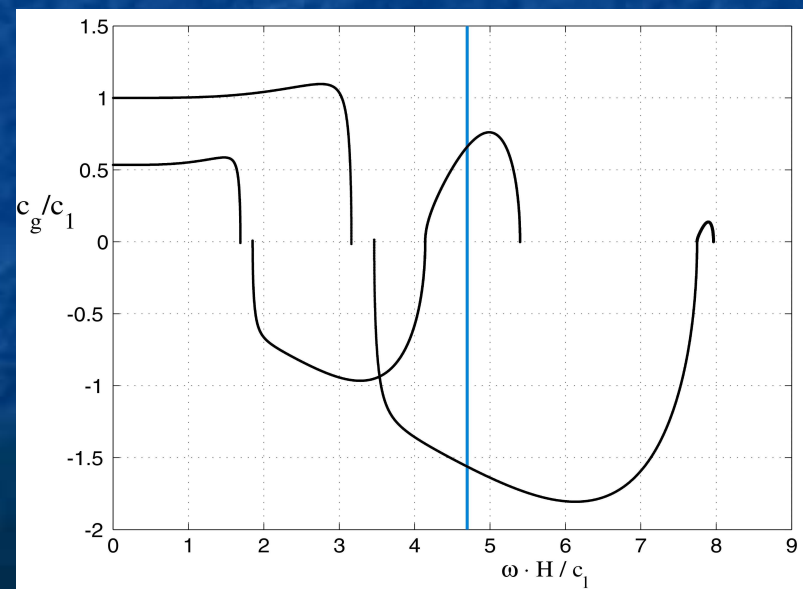
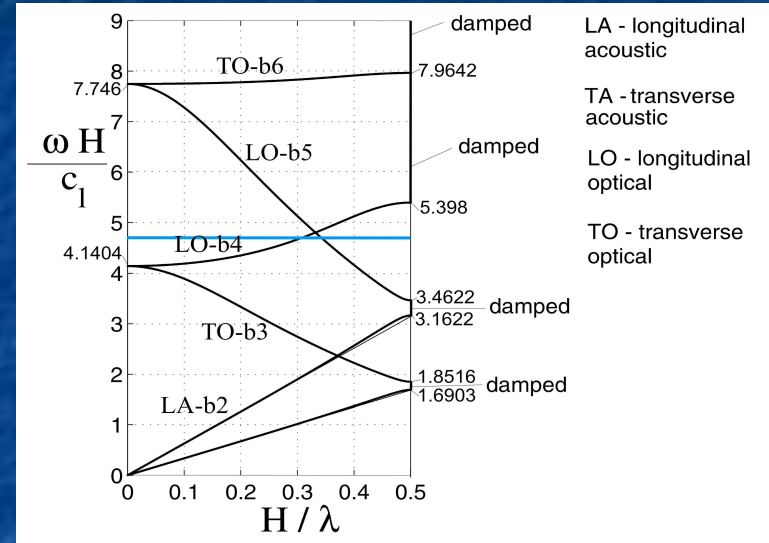
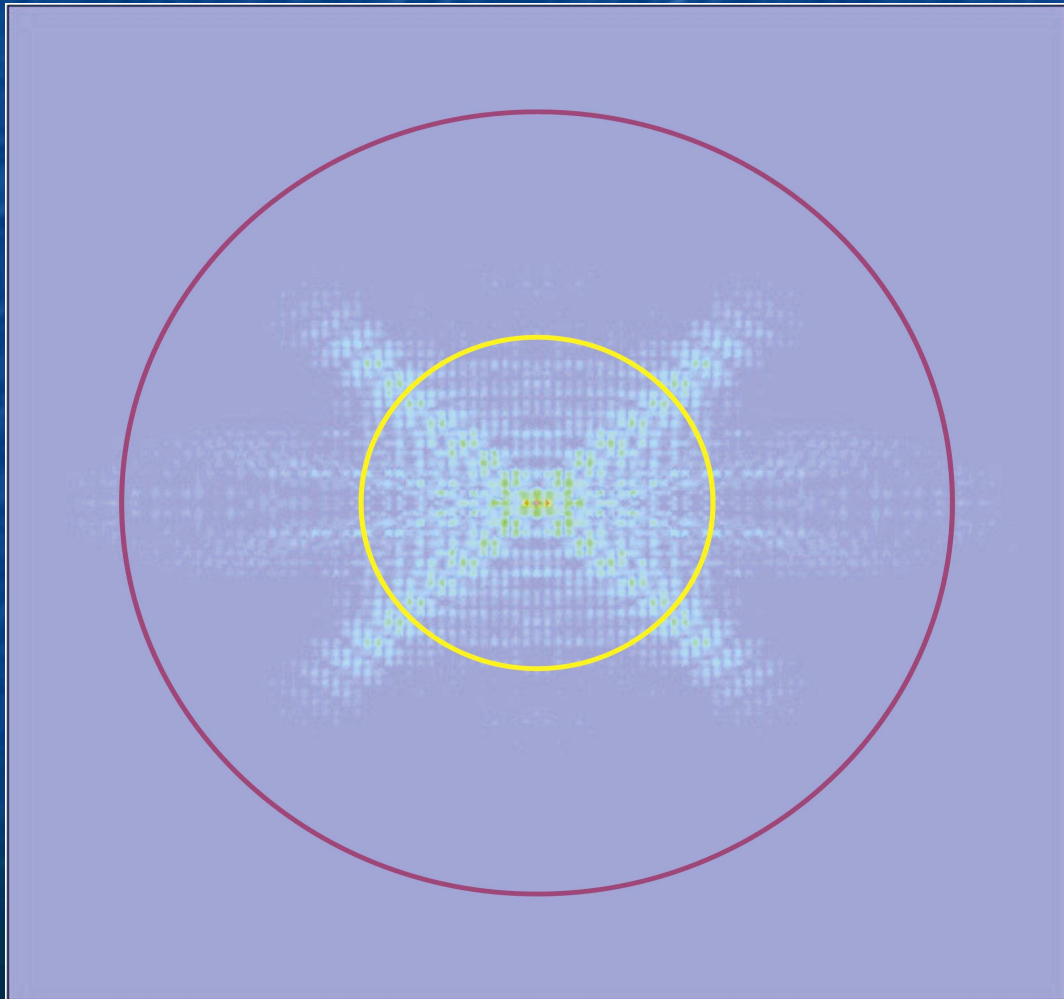
branch b4



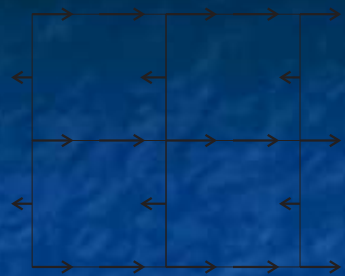
branch b5



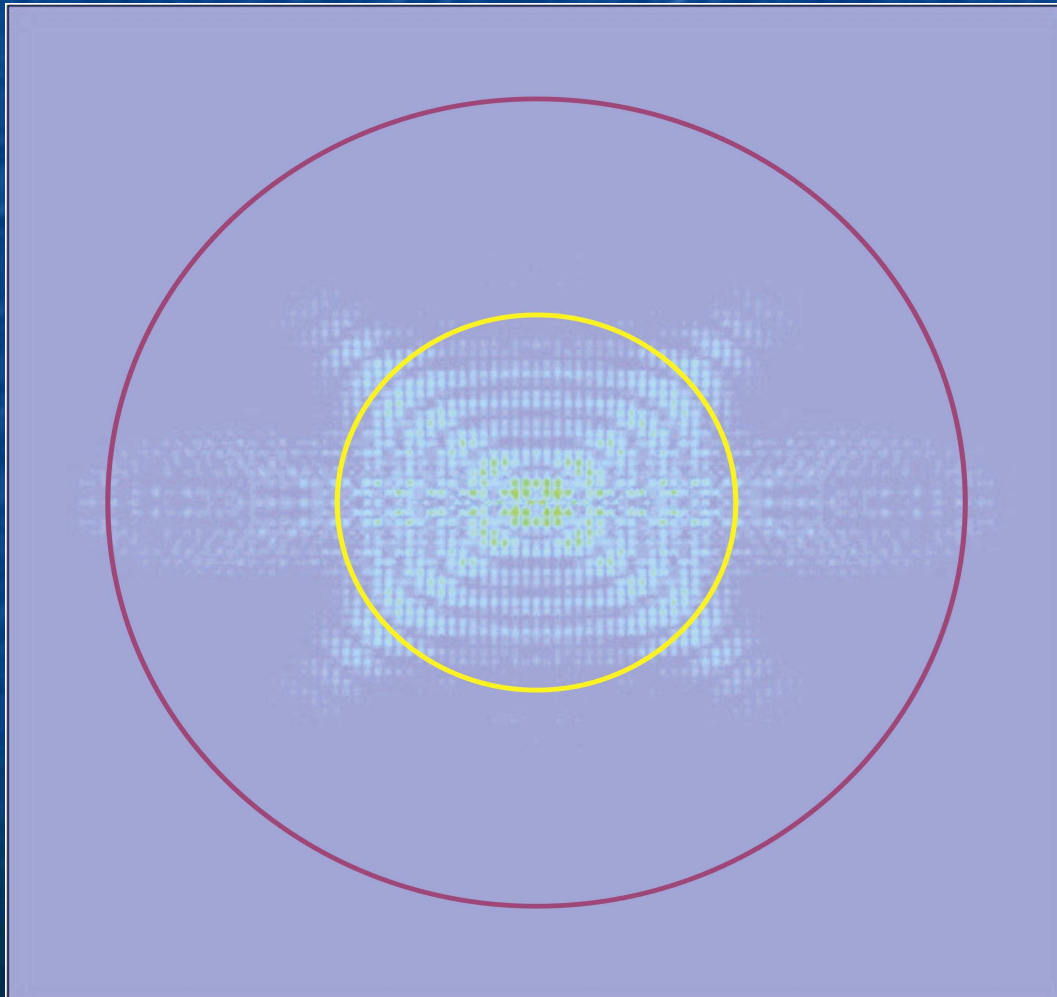
$$\omega H / c_1 = 4.7$$



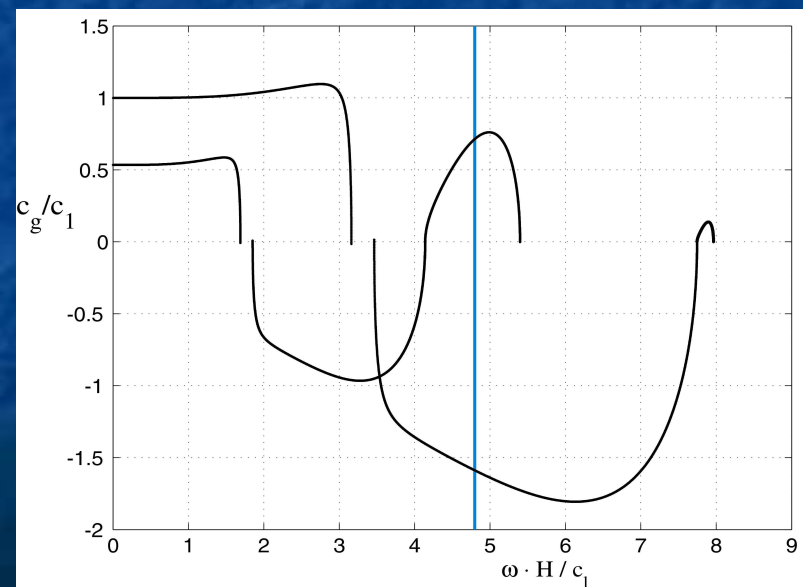
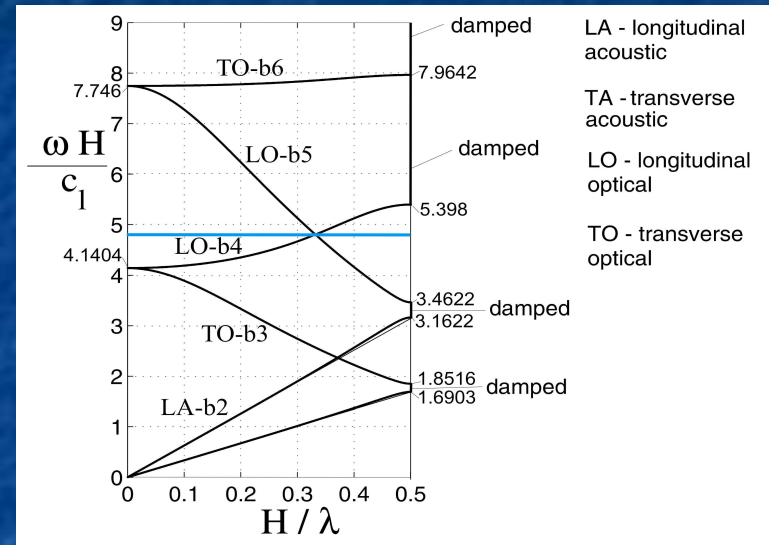
branch b4



branch b5



$$\omega H / c_1 = 4.8$$



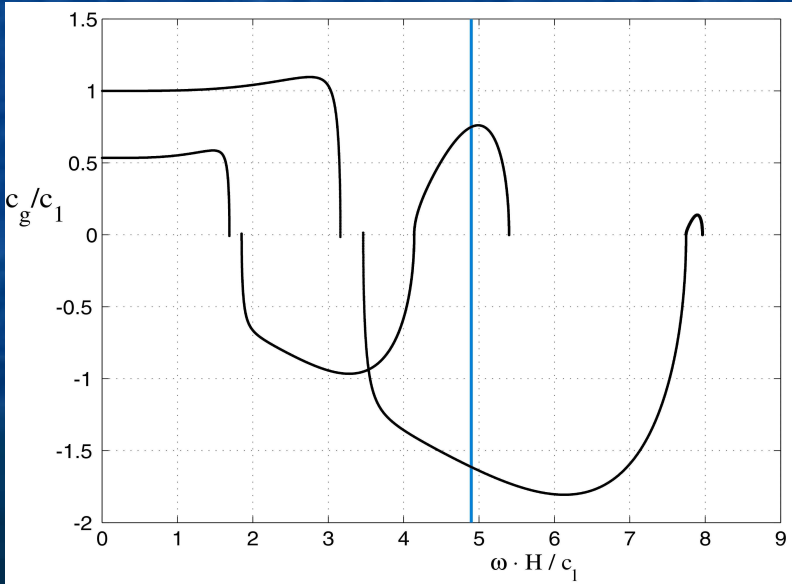
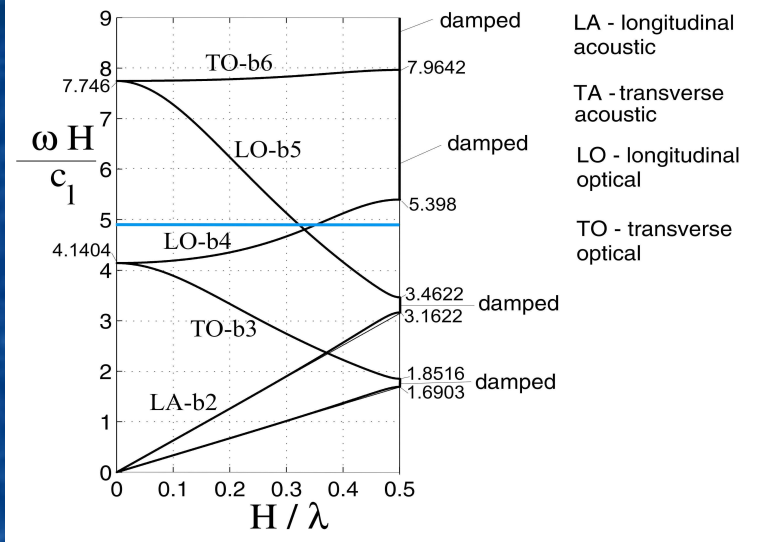
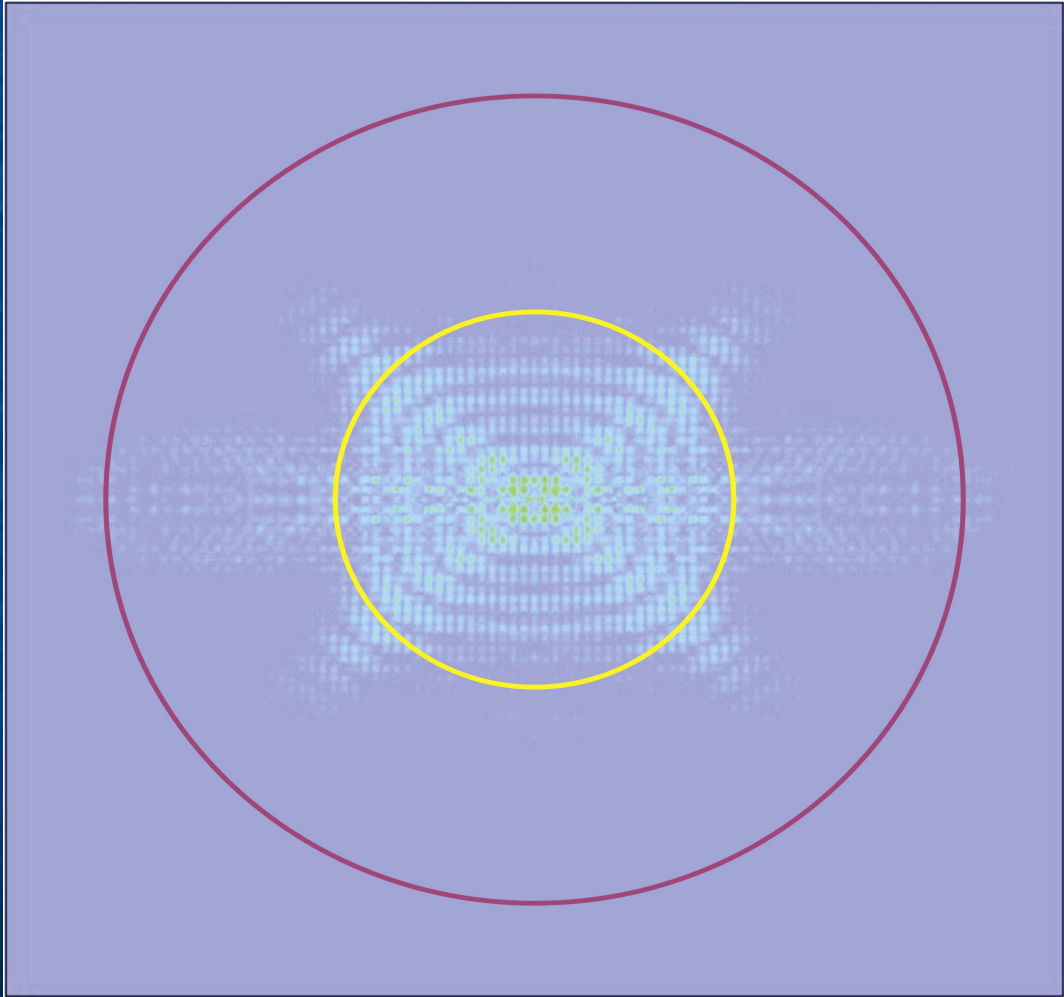
branch b4



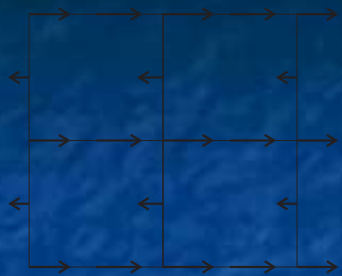
branch b5



$$\omega H / c_1 = 4.9$$



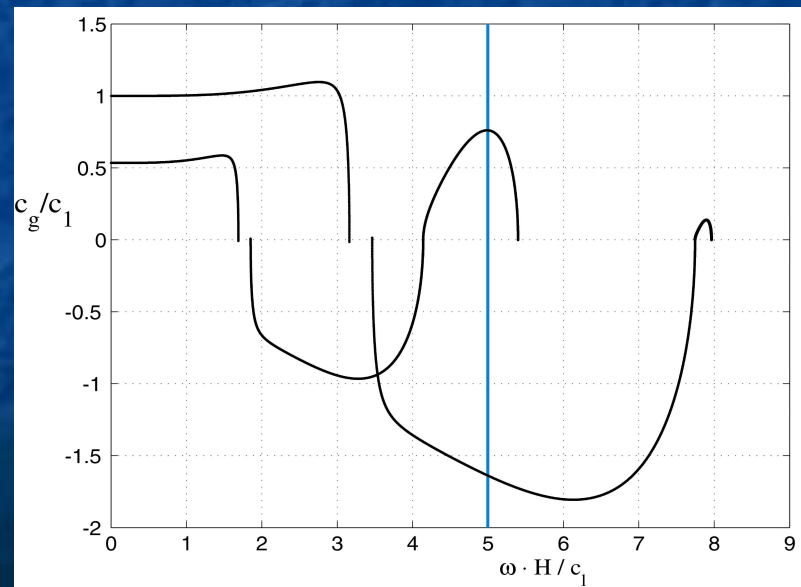
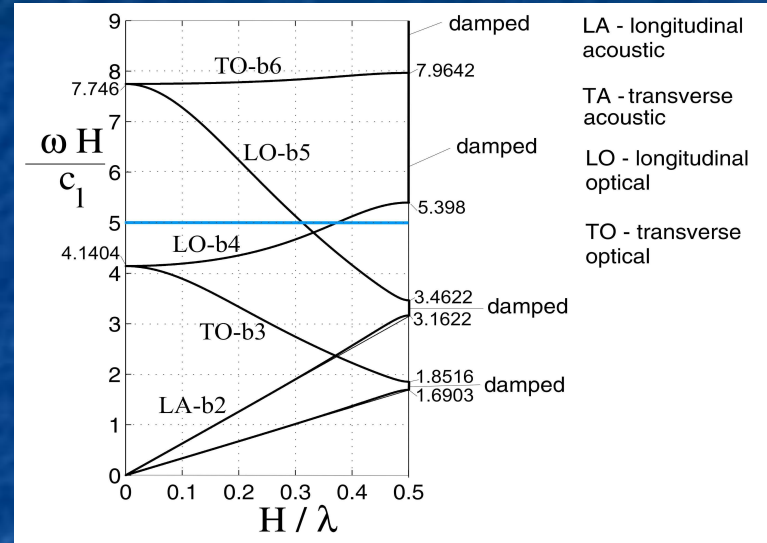
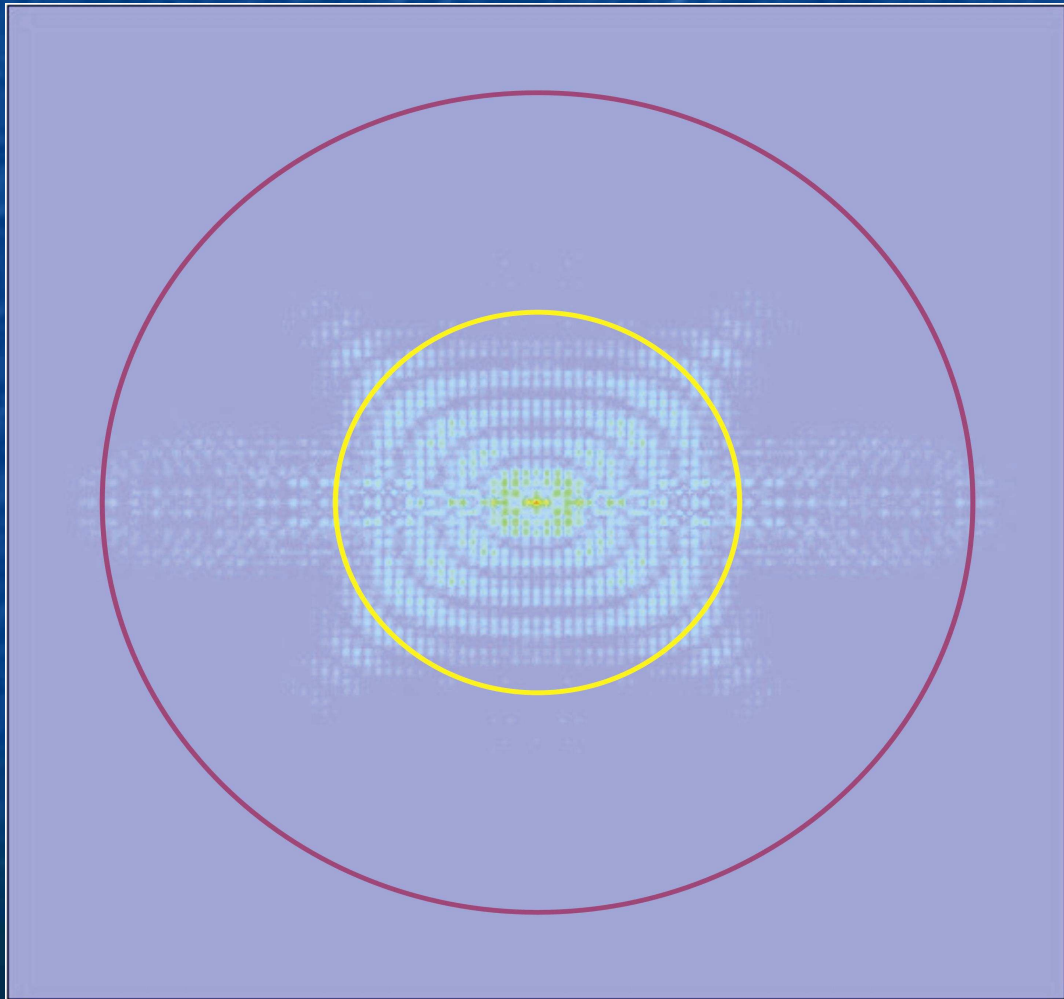
branch b4



branch b5



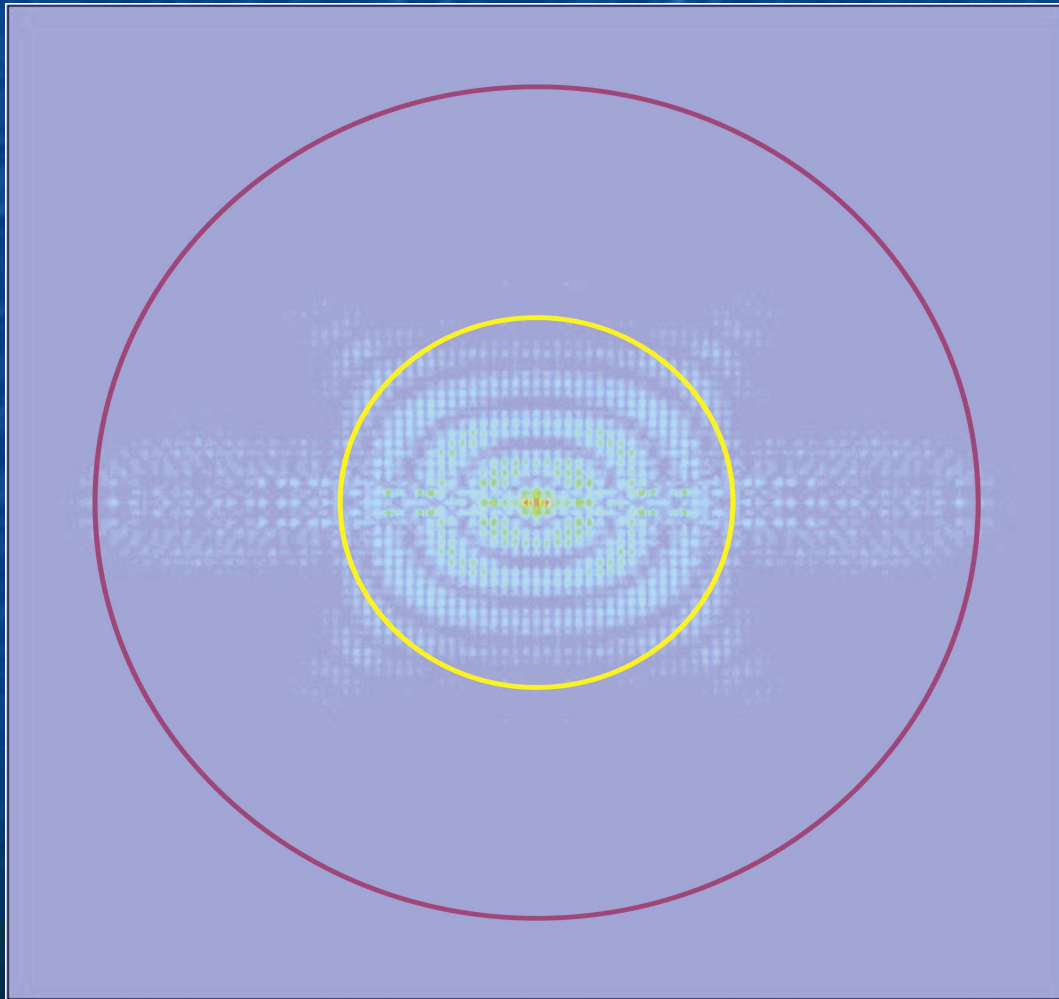
$$\omega H / c_1 = 5.0$$



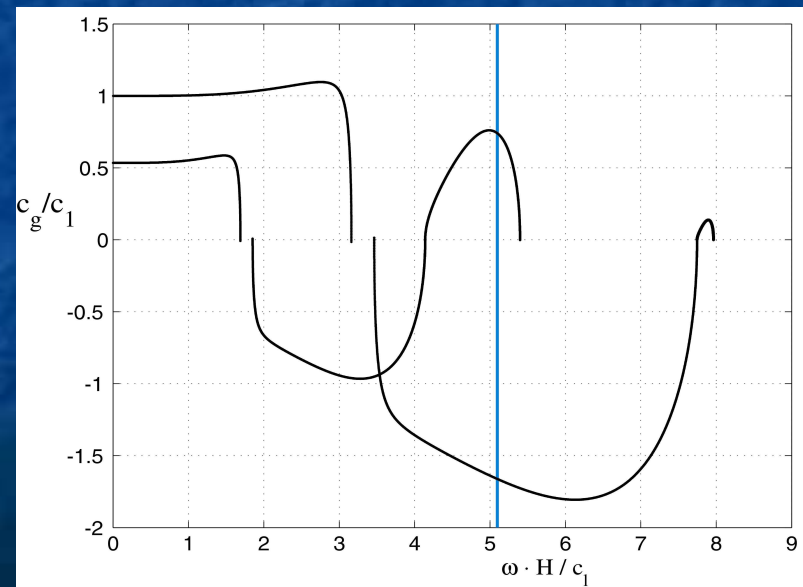
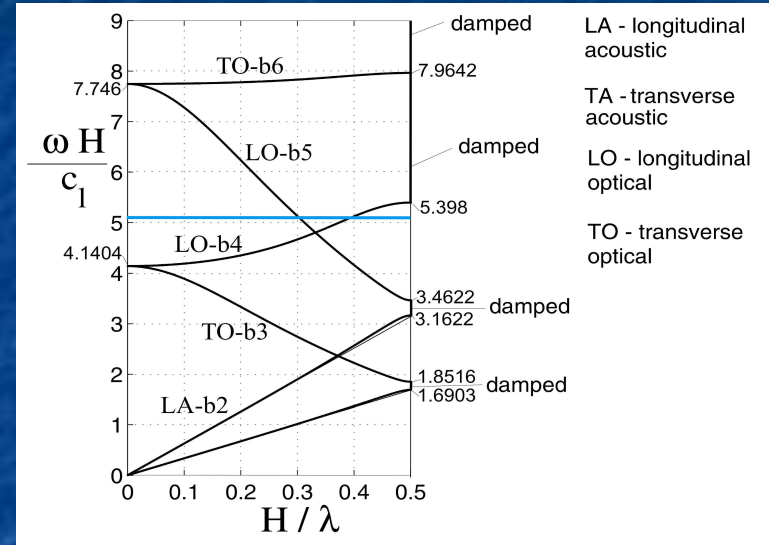
branch b4



branch b5



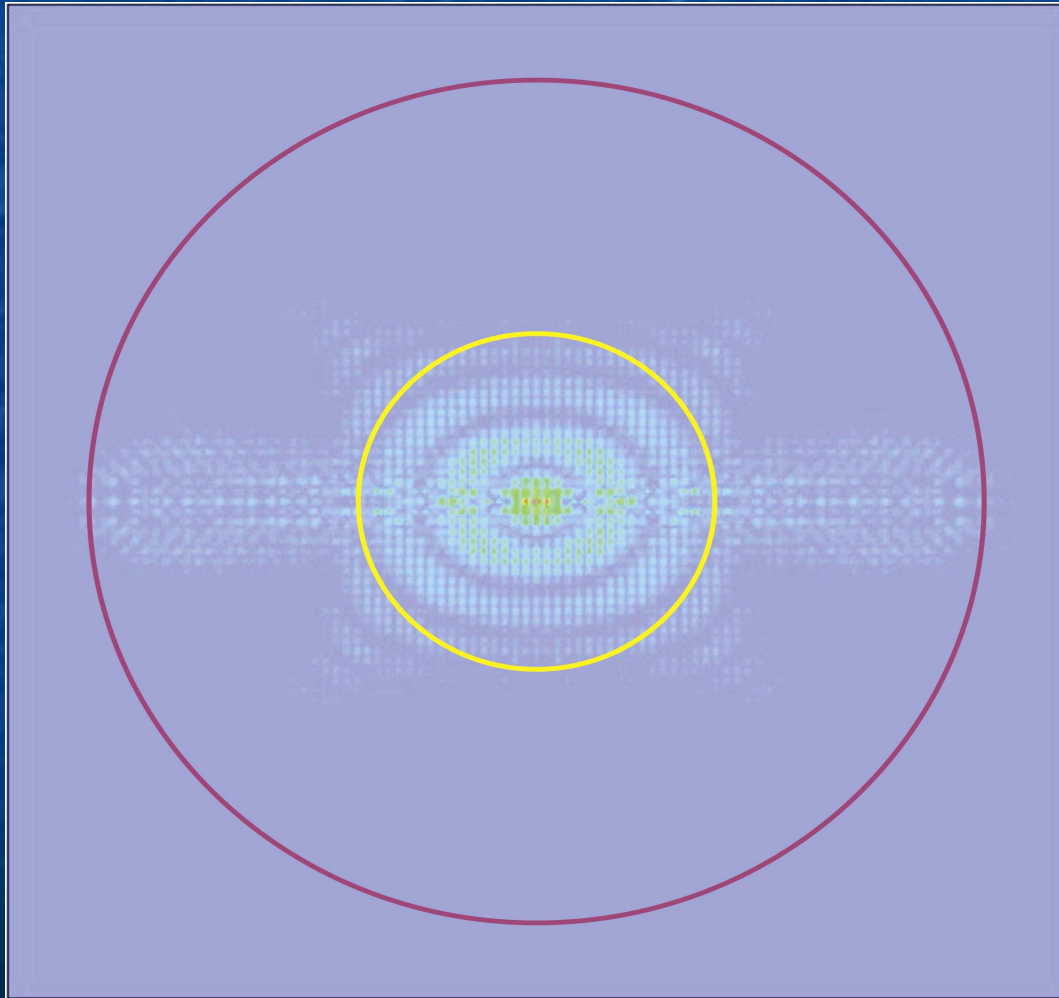
$$\omega H / c_1 = 5.1$$



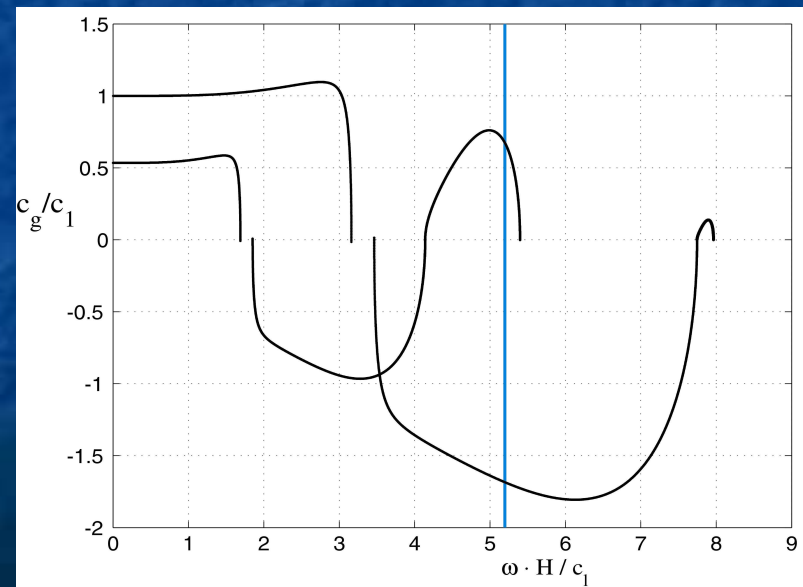
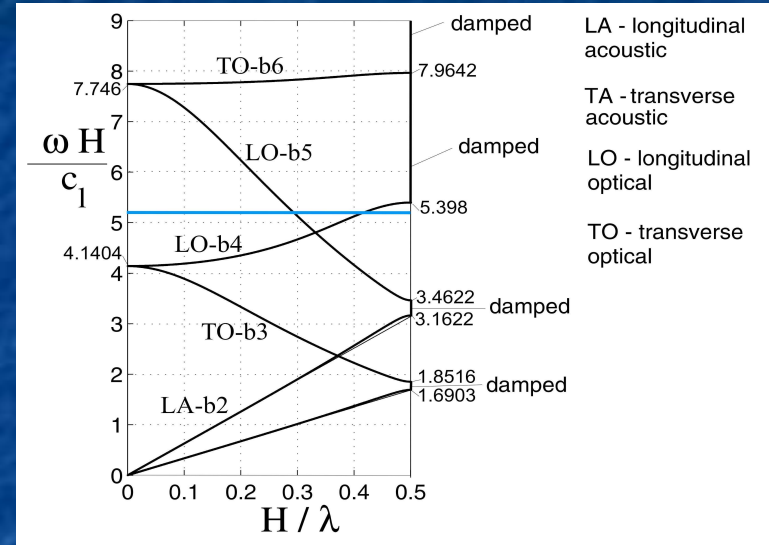
branch b4



branch b5



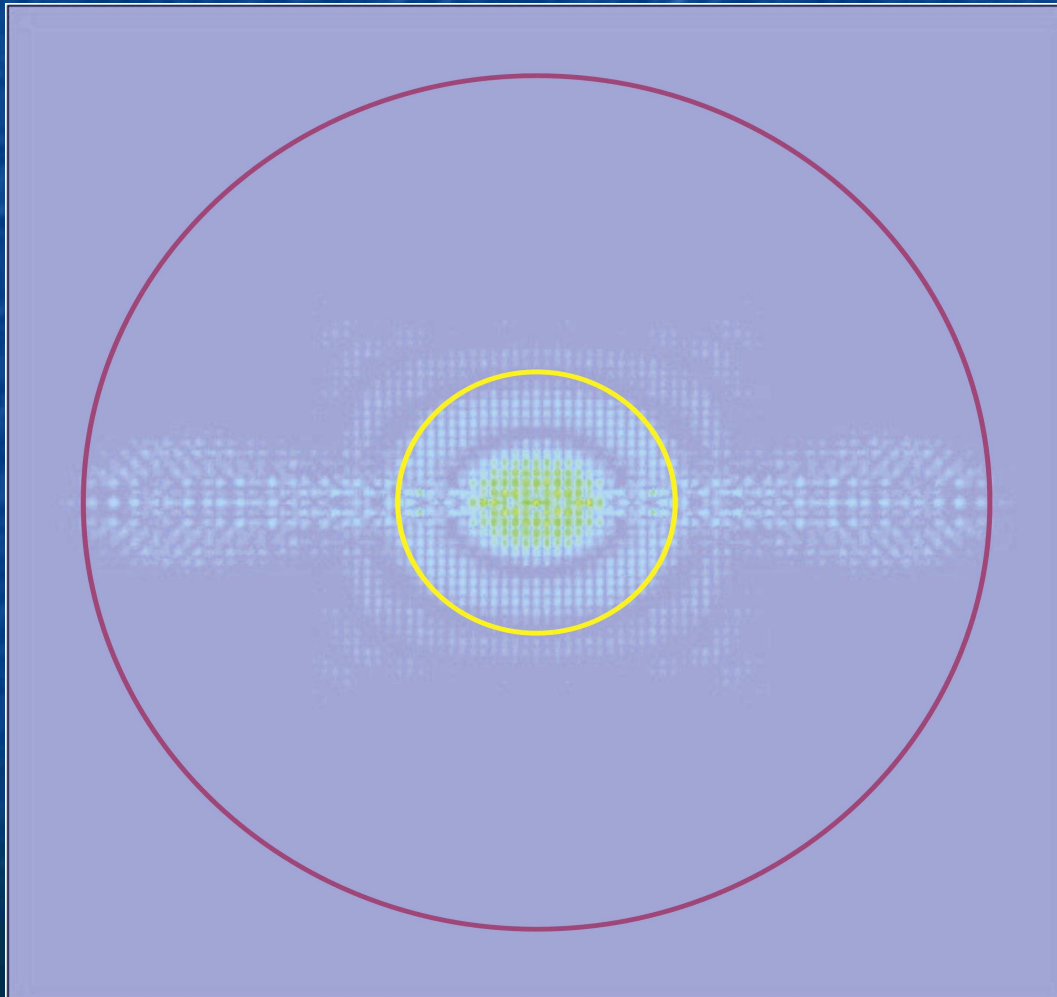
$$\omega H / c_1 = 5.2$$



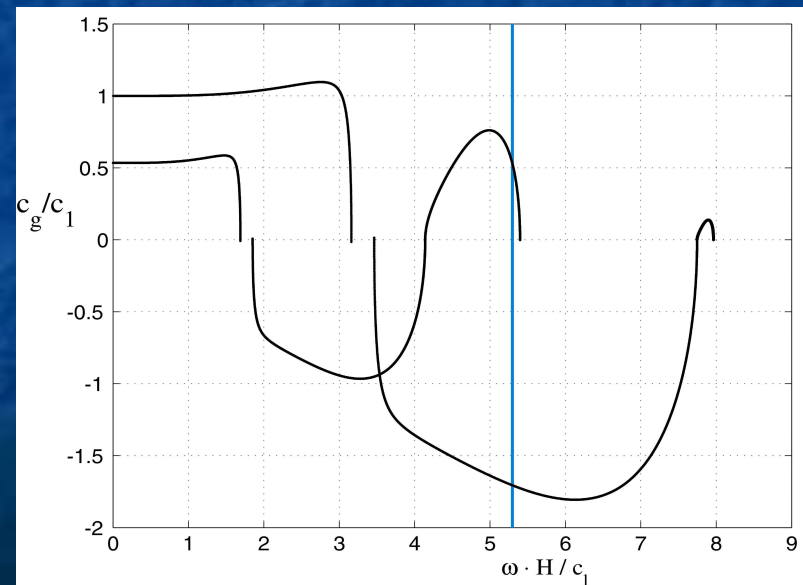
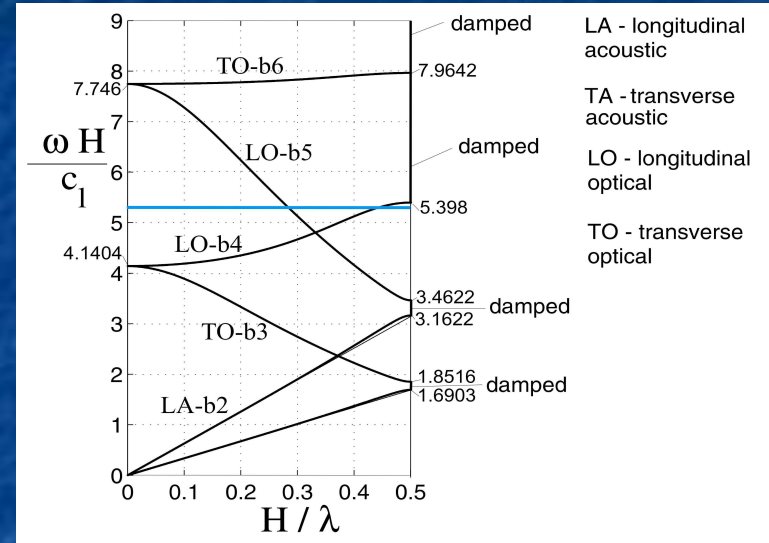
branch b4



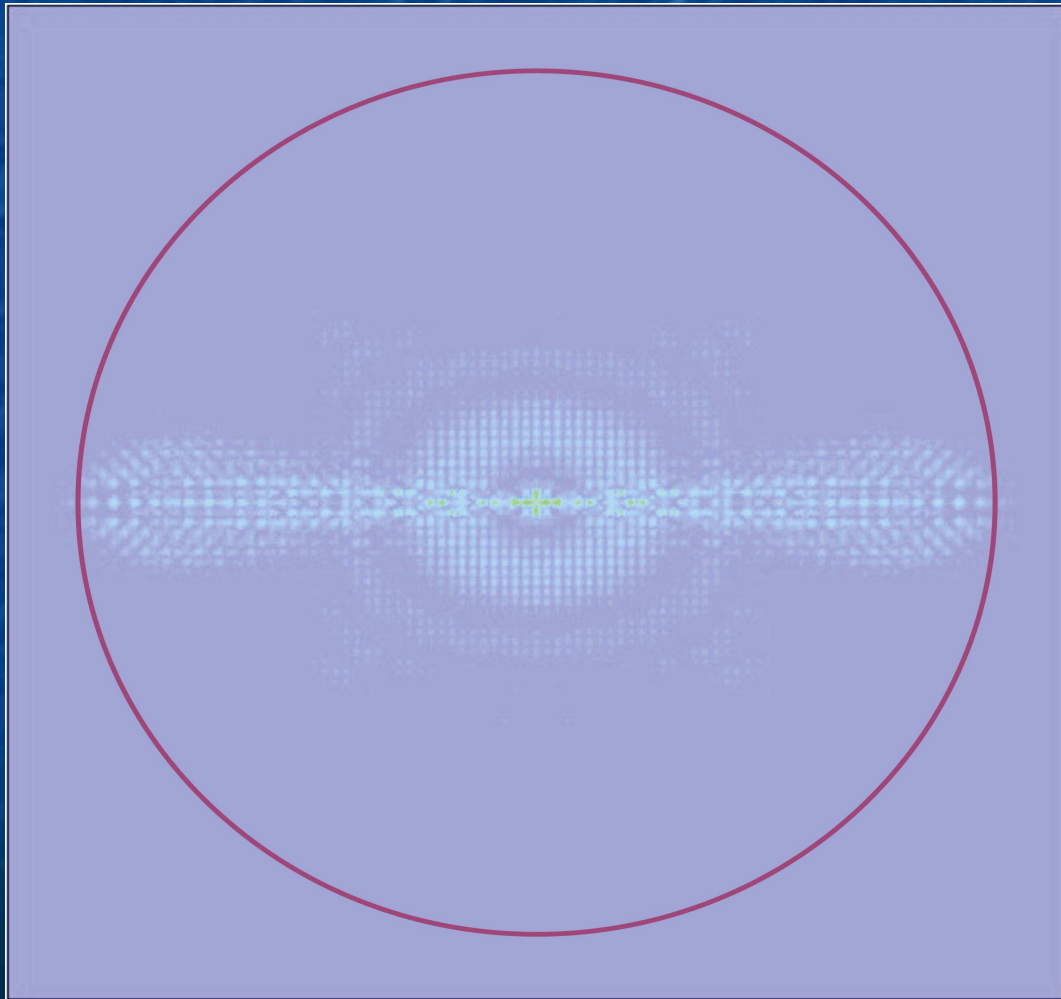
branch b5



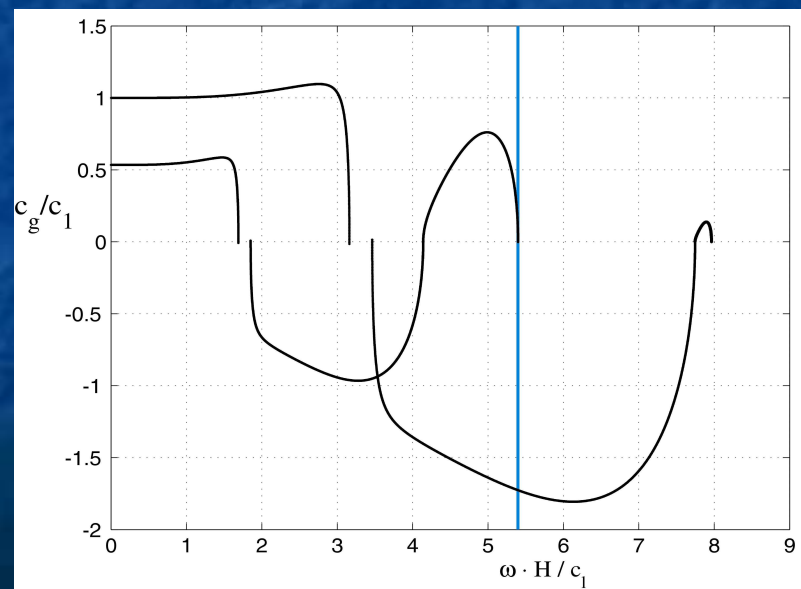
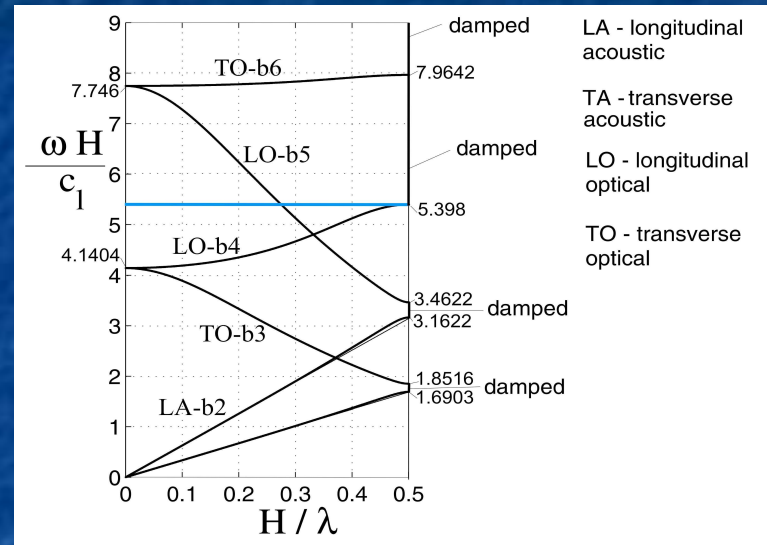
$$\omega H / c_1 = 5.3$$



branch b5



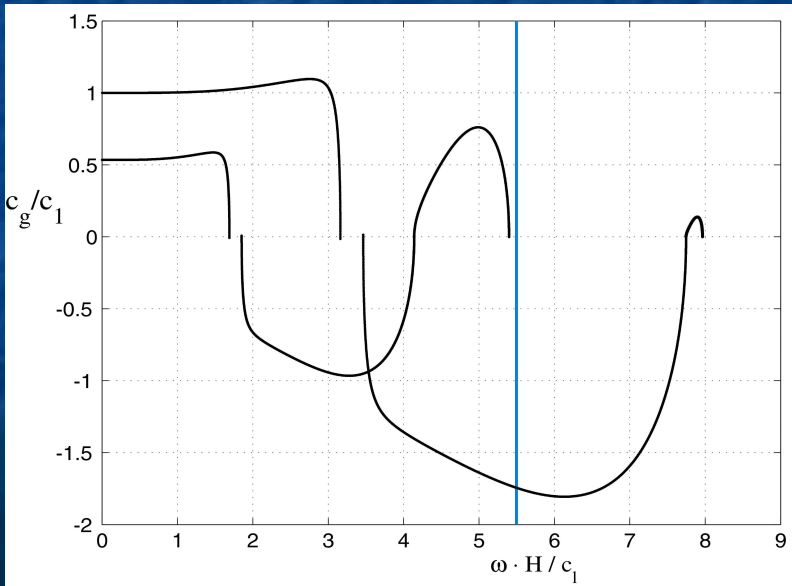
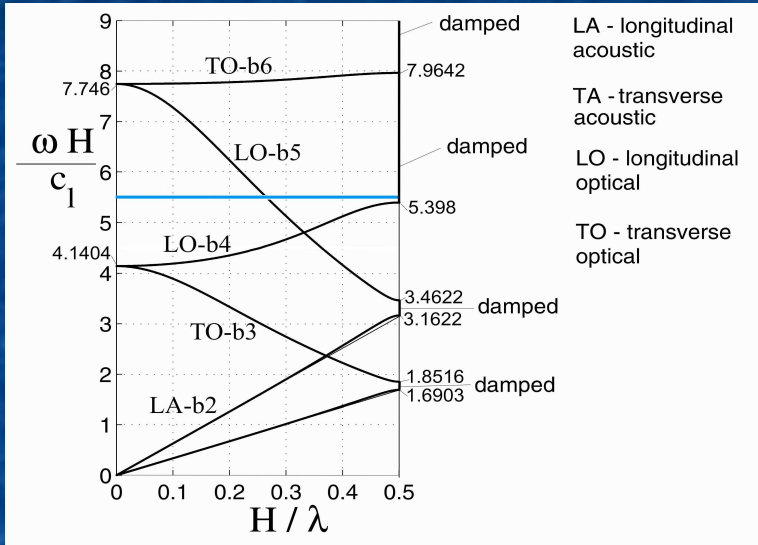
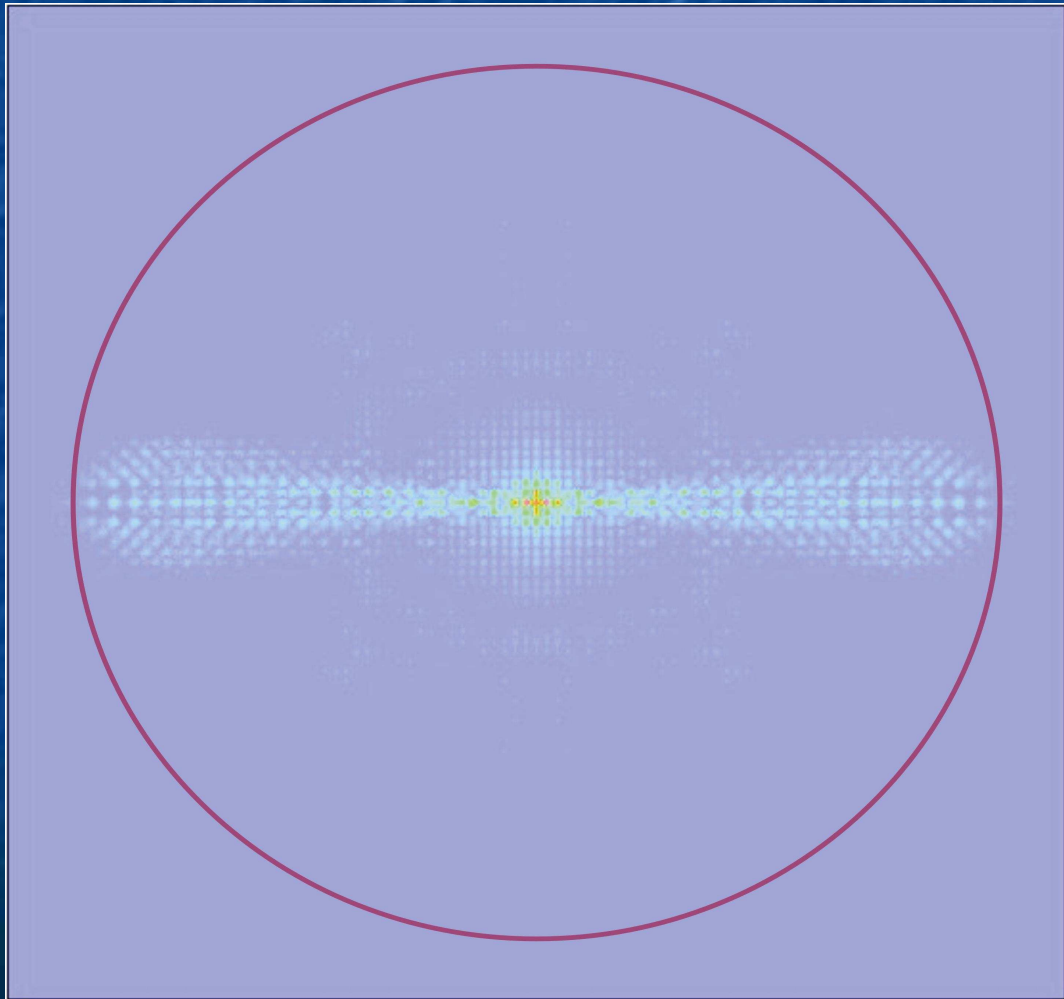
$$\omega H / c_1 = 5.4$$



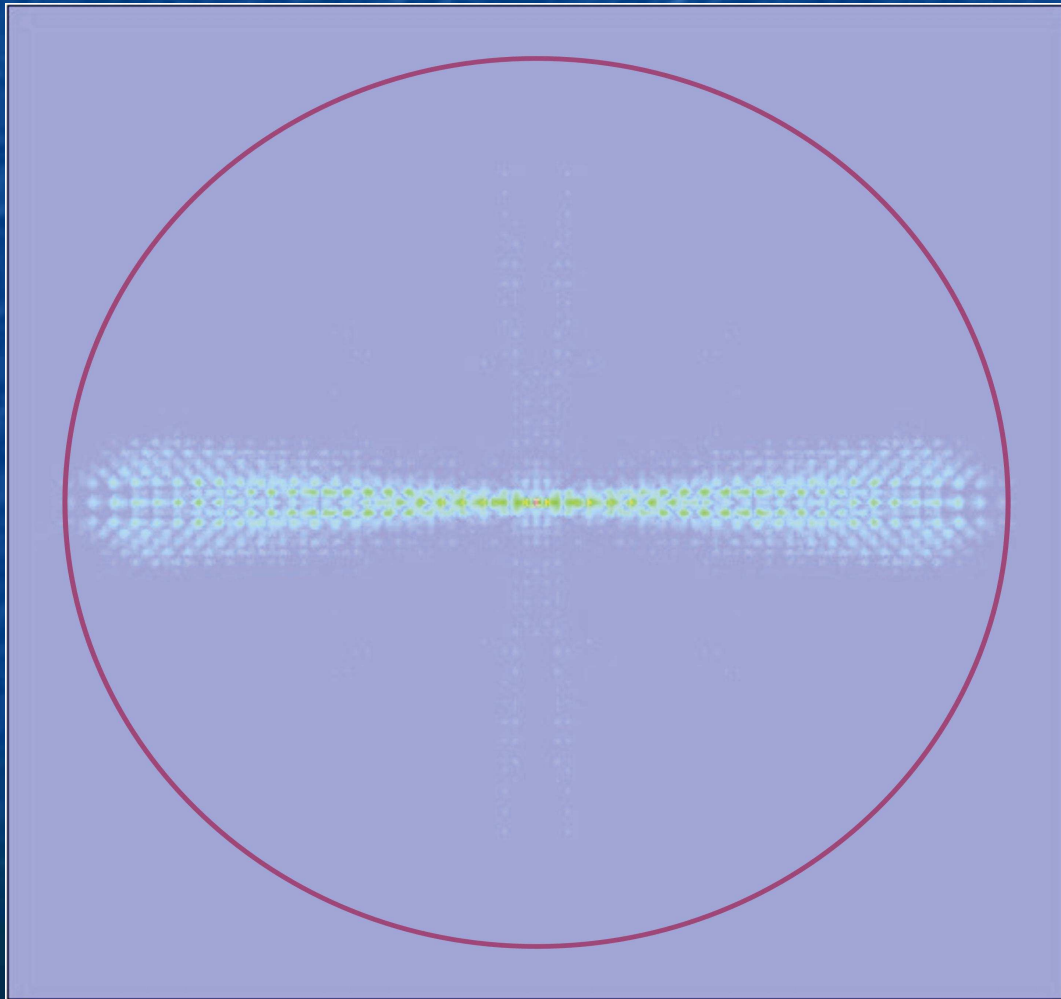
branch b5



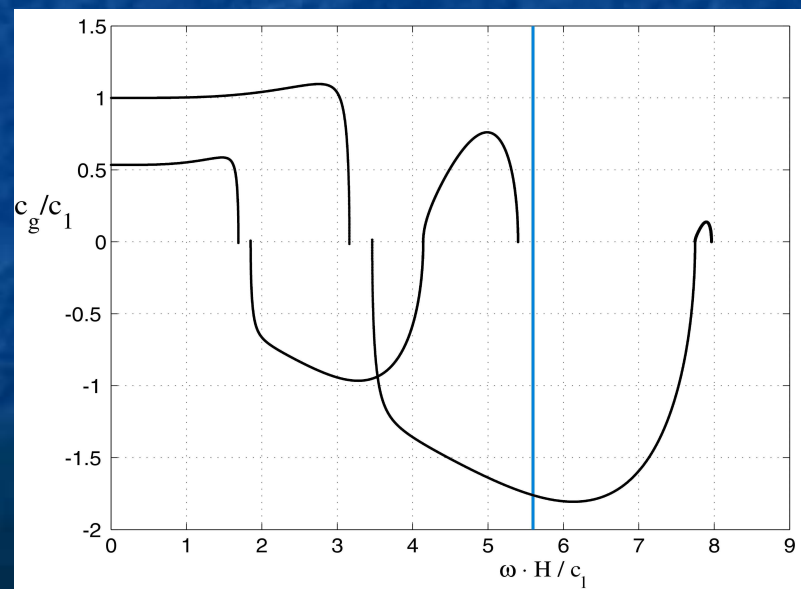
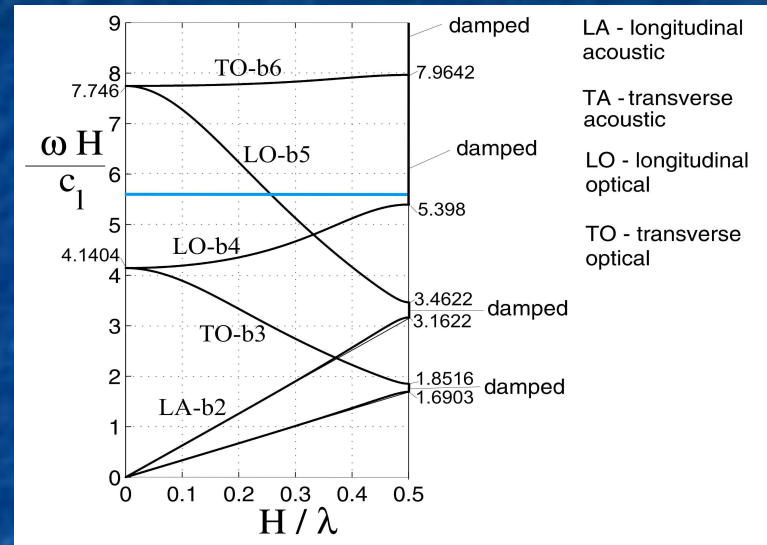
$$\omega H / c_1 = 5.5$$



branch b5



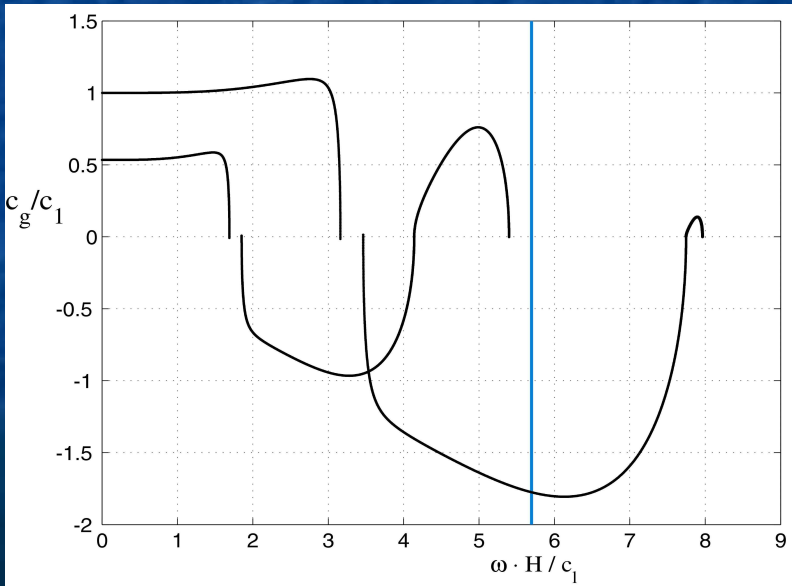
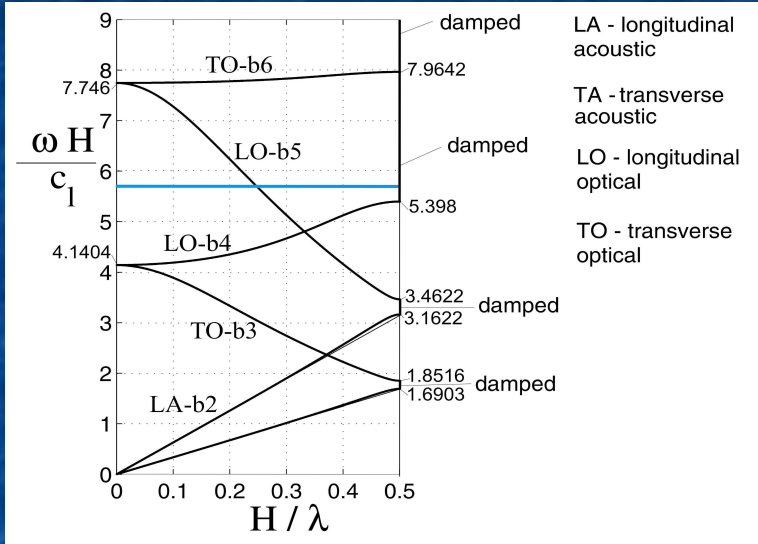
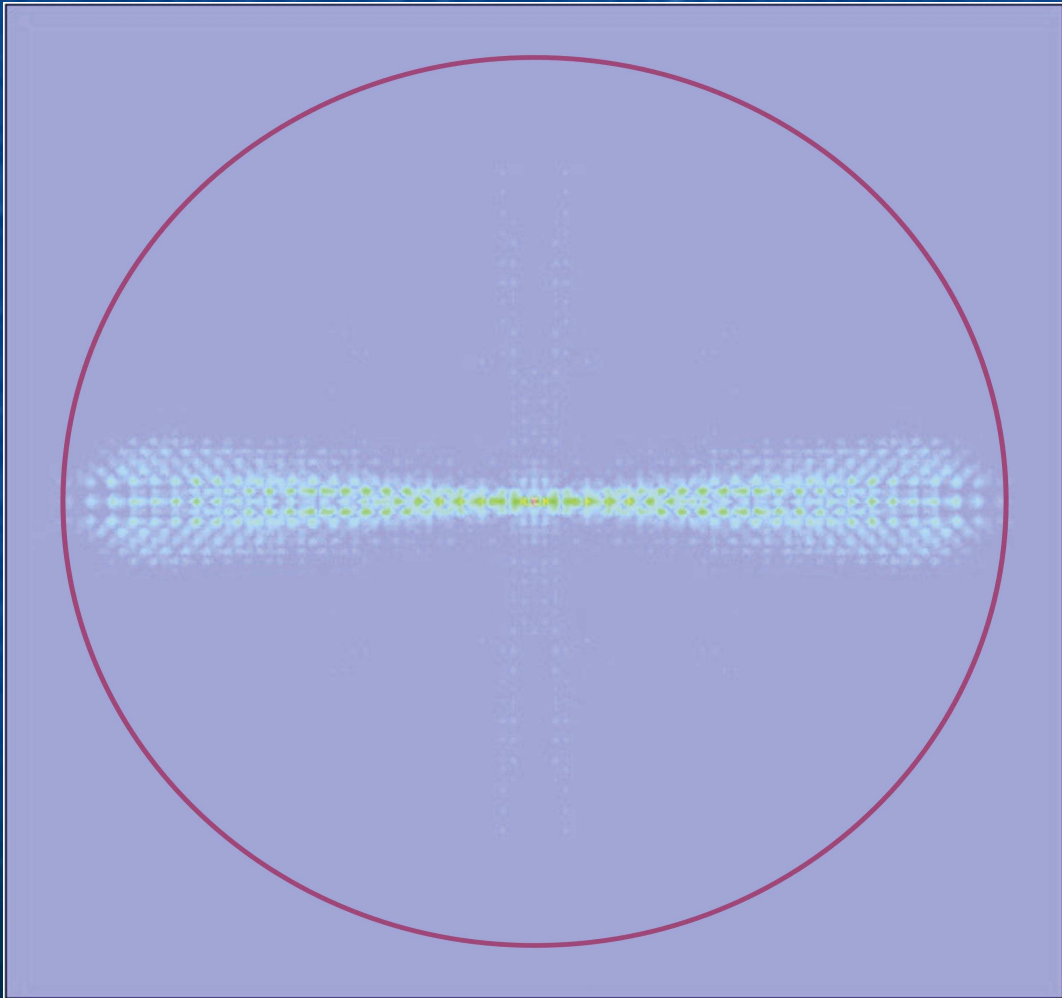
$$\omega H / c_1 = 5.6$$



branch b5



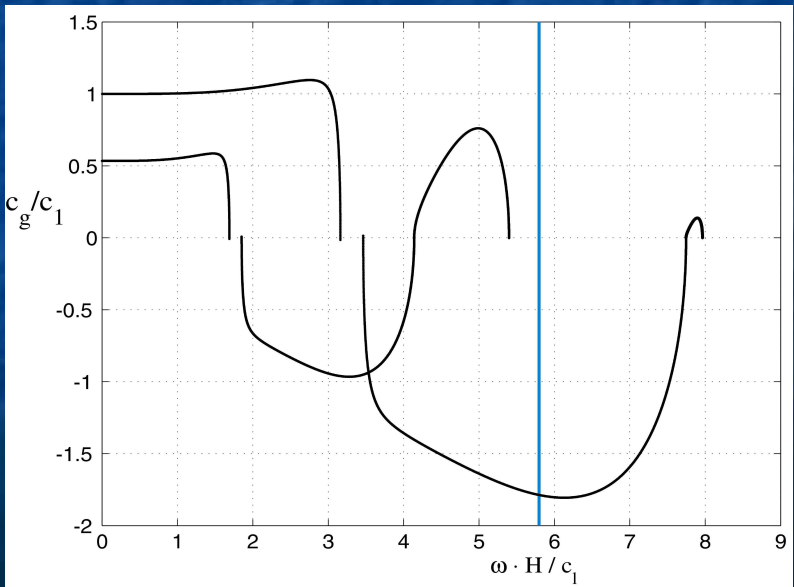
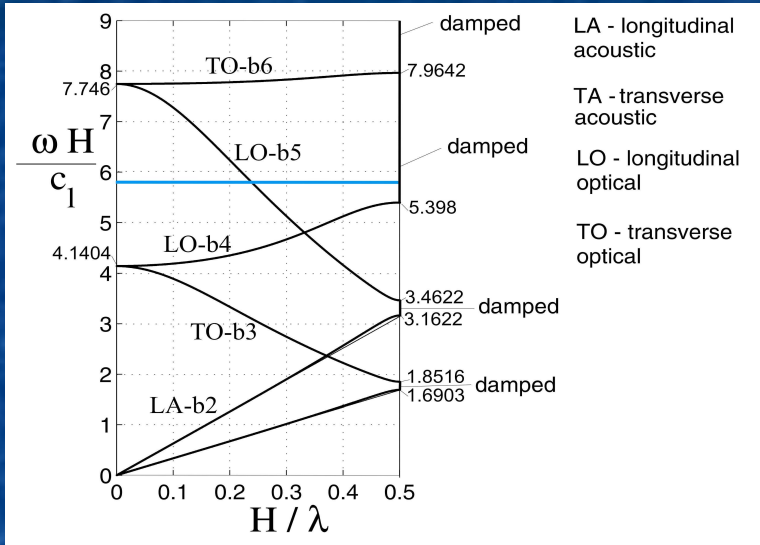
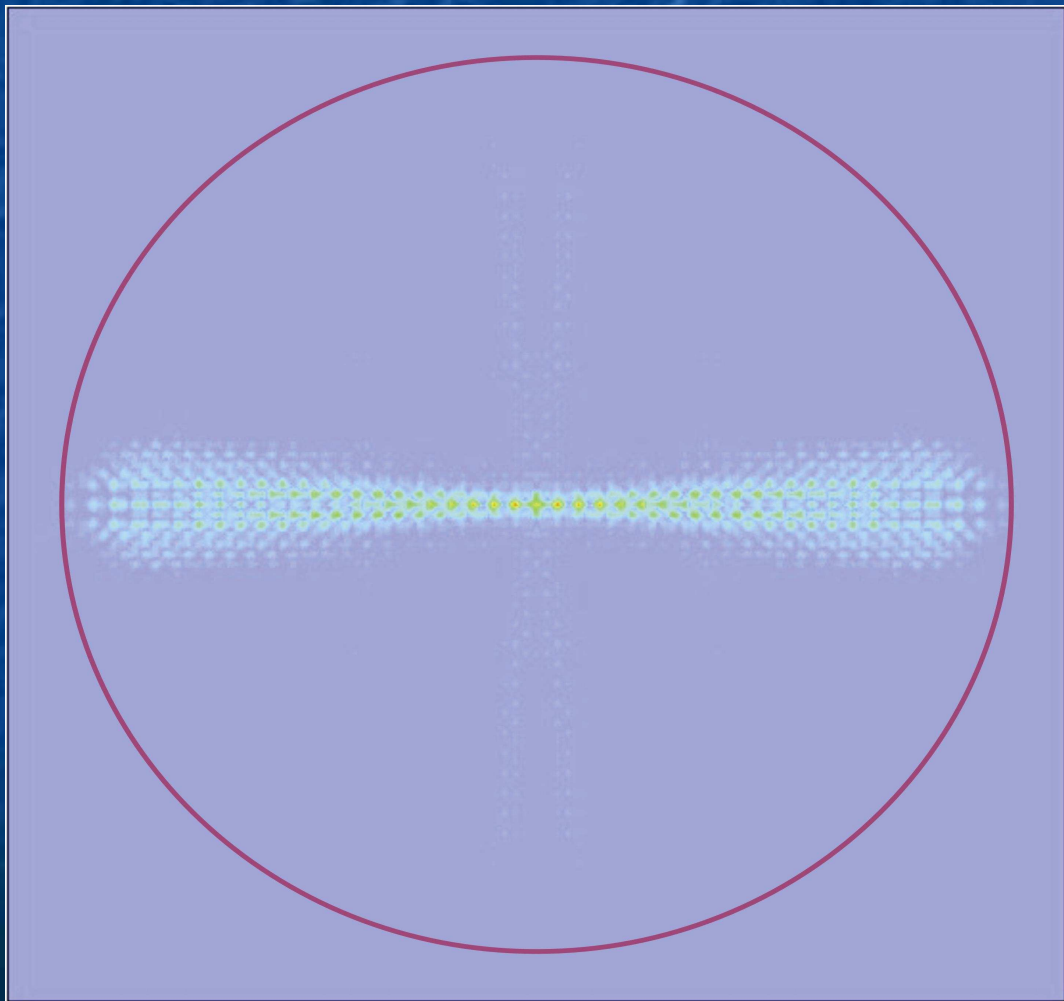
$$\omega H / c_1 = 5.7$$



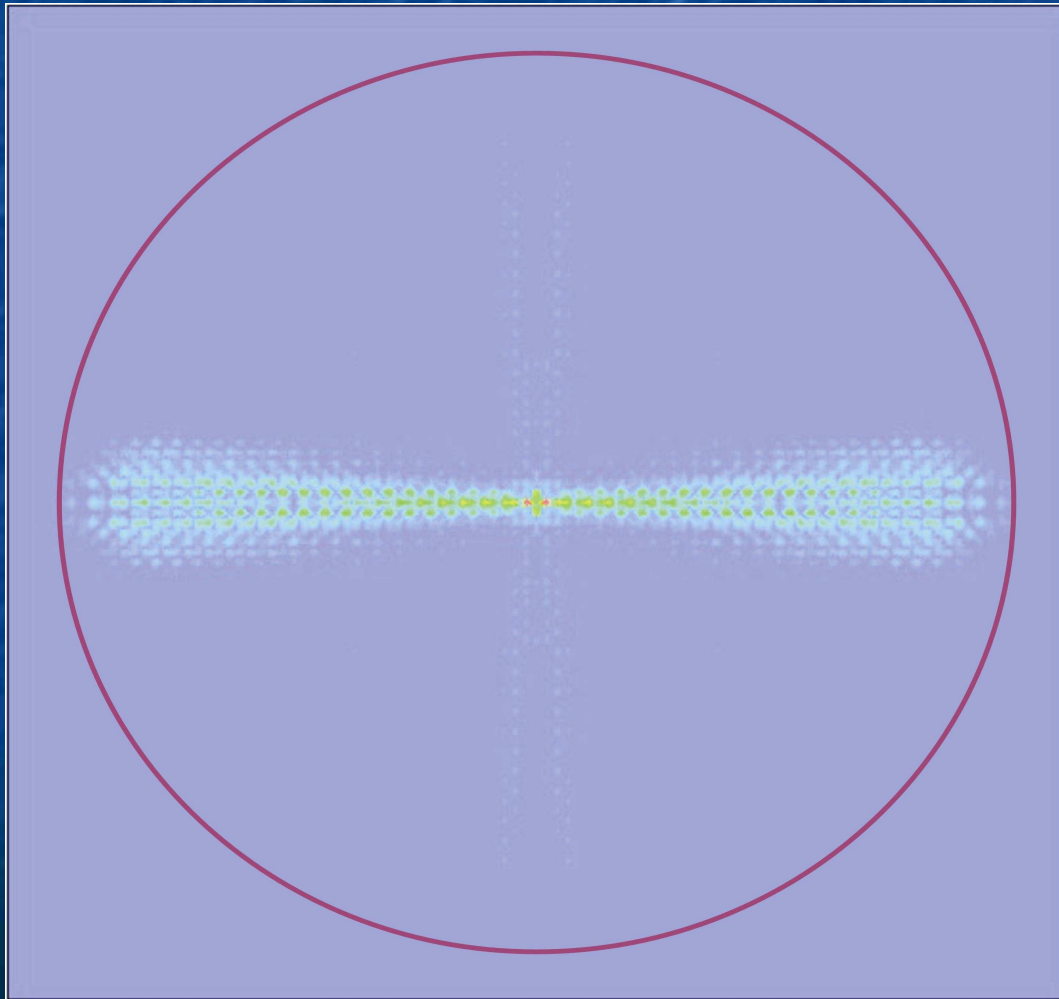
branch b5



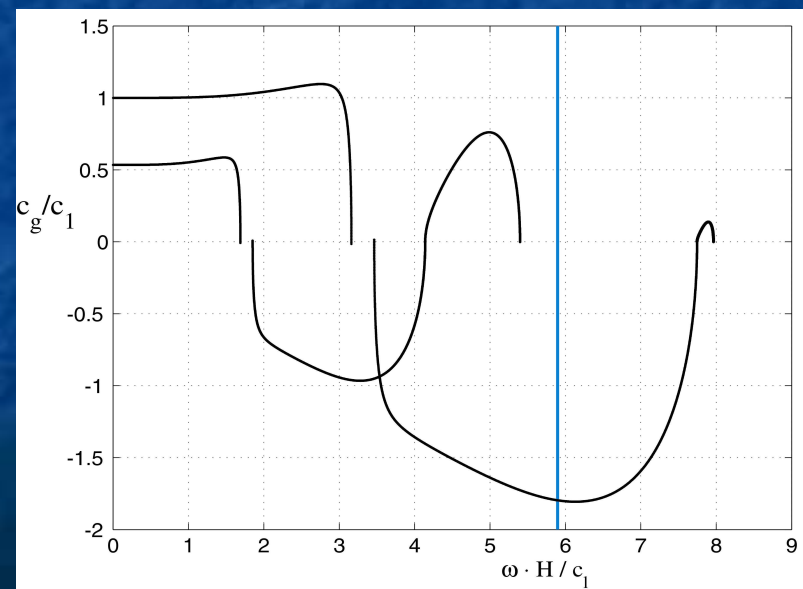
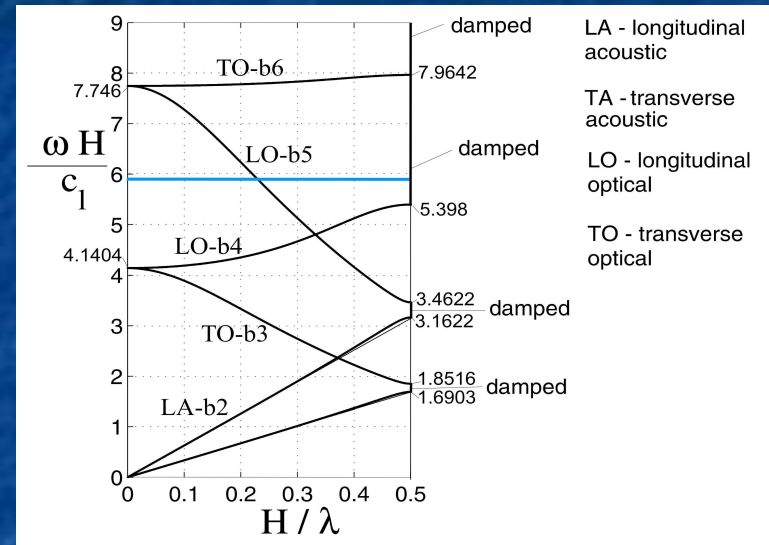
$$\omega H / c_1 = 5.8$$



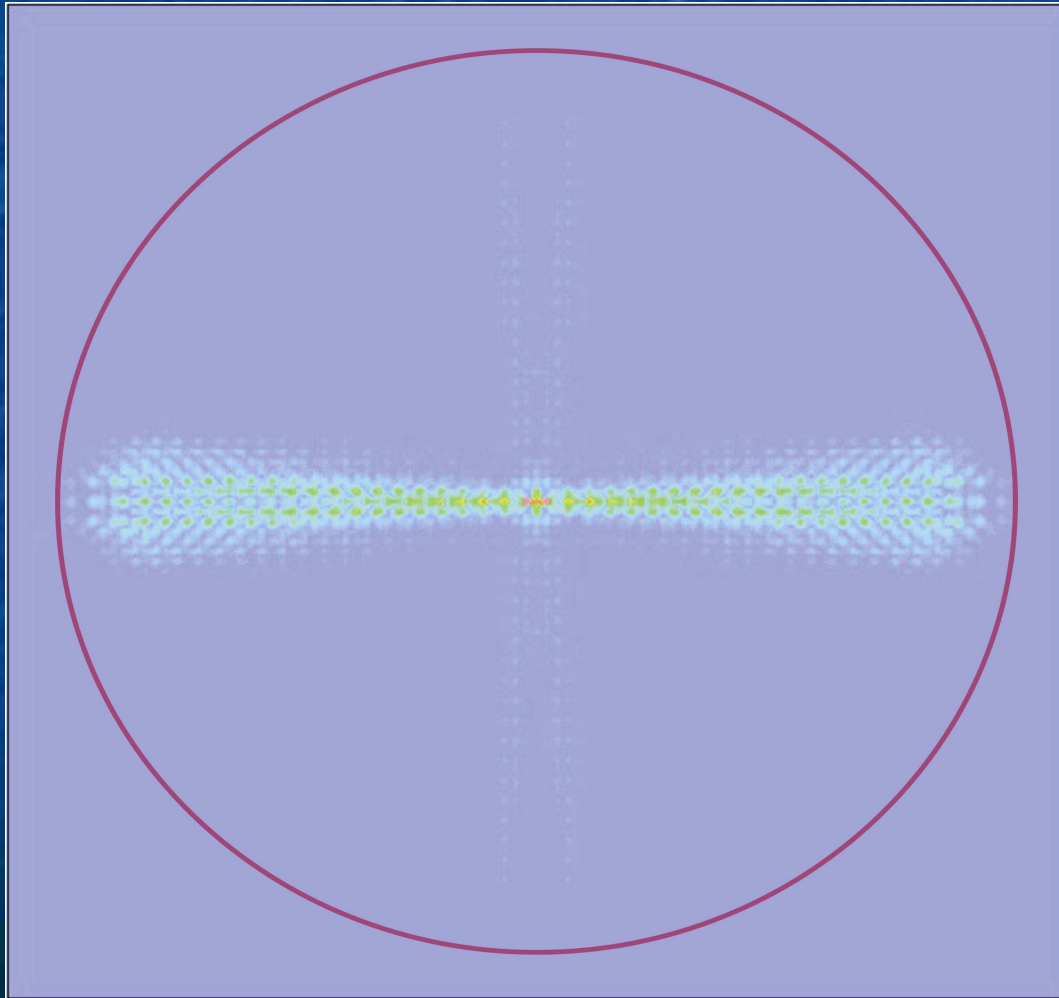
branch b5



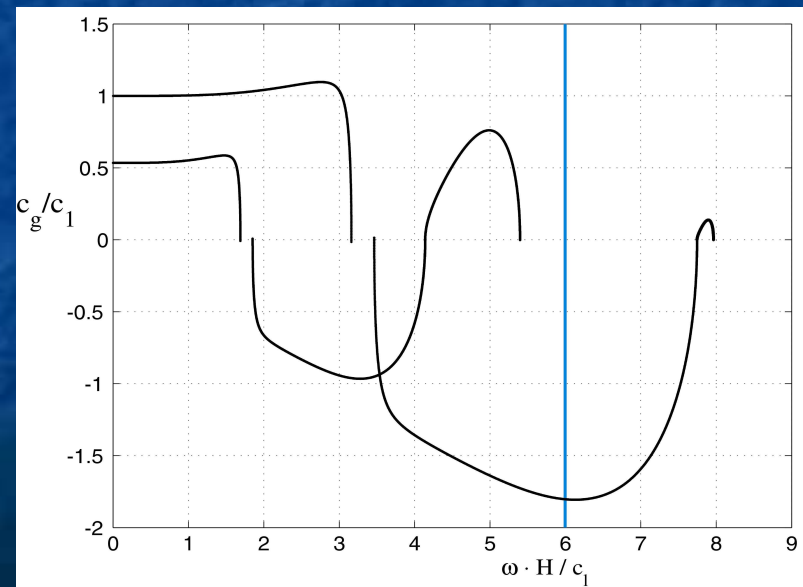
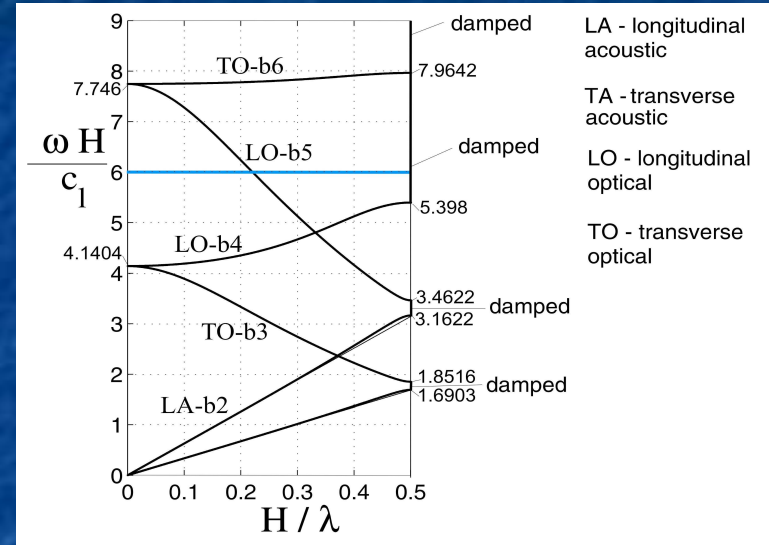
$$\omega H / c_1 = 5.9$$



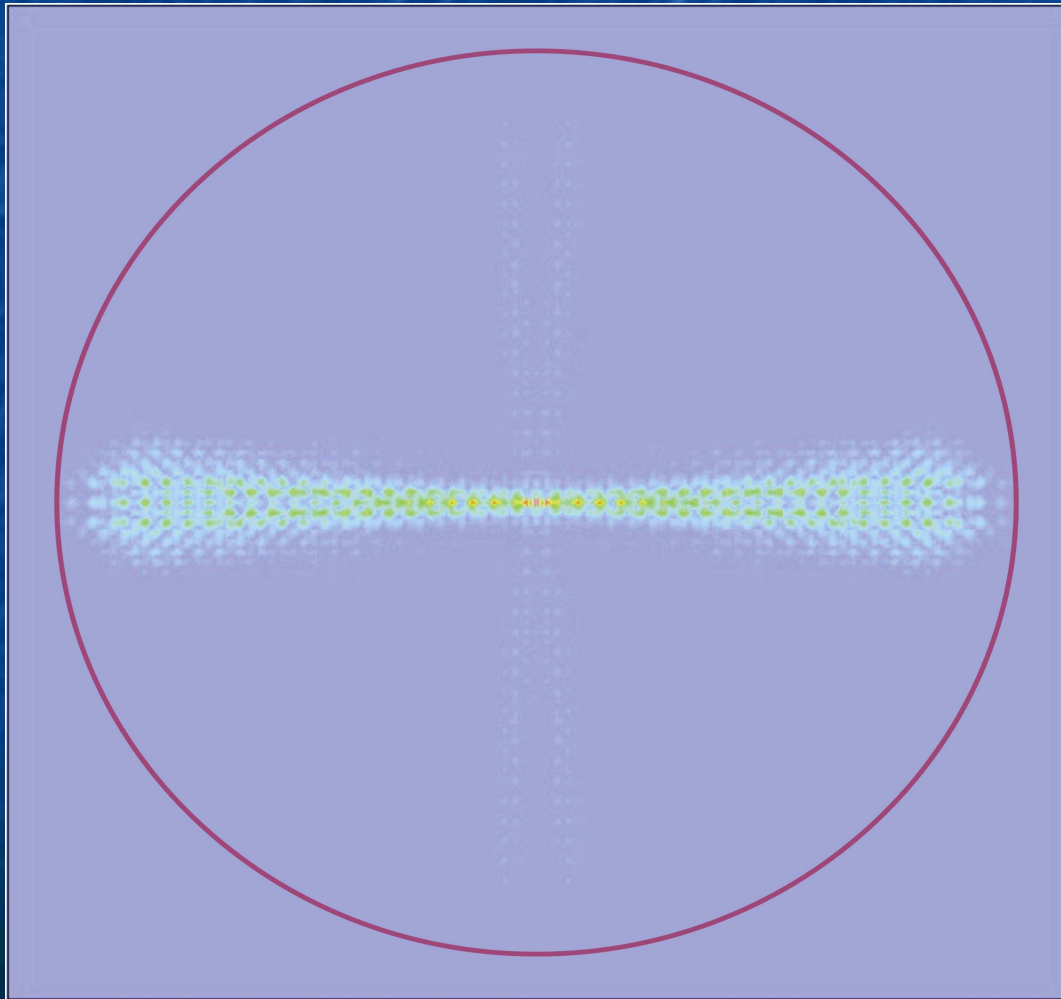
branch b5



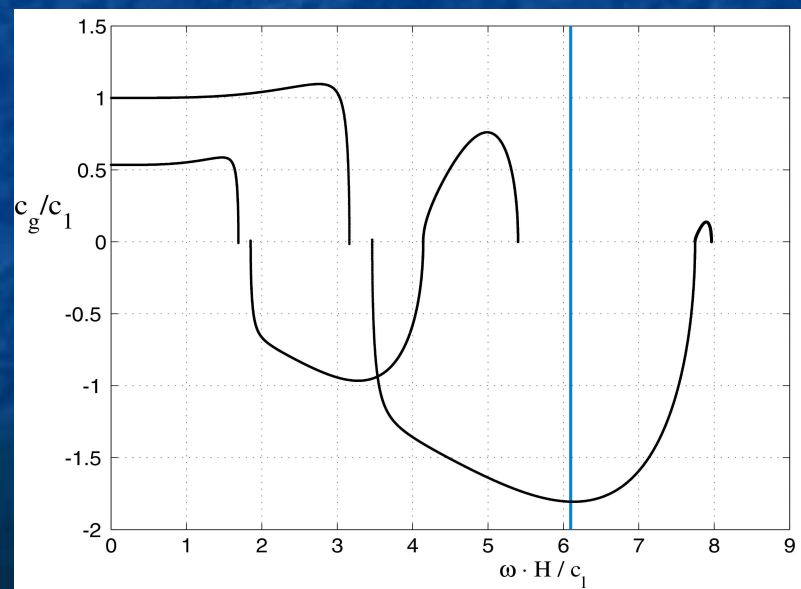
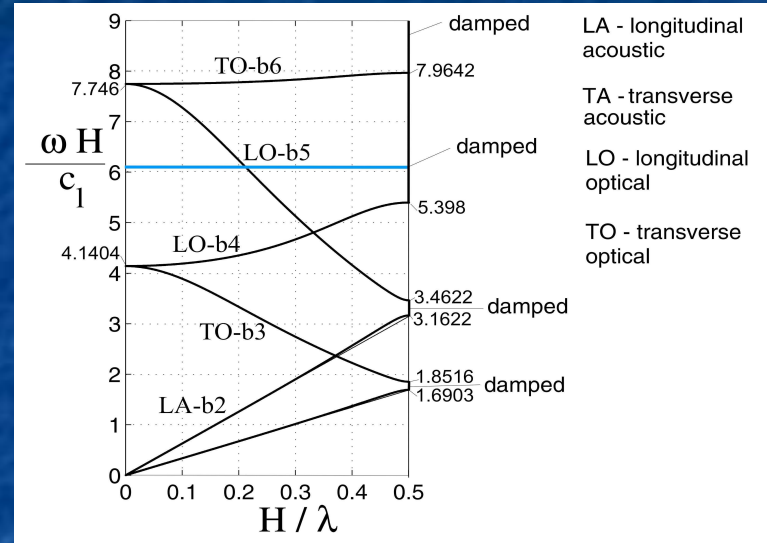
$$\omega H / c_1 = 6.0$$



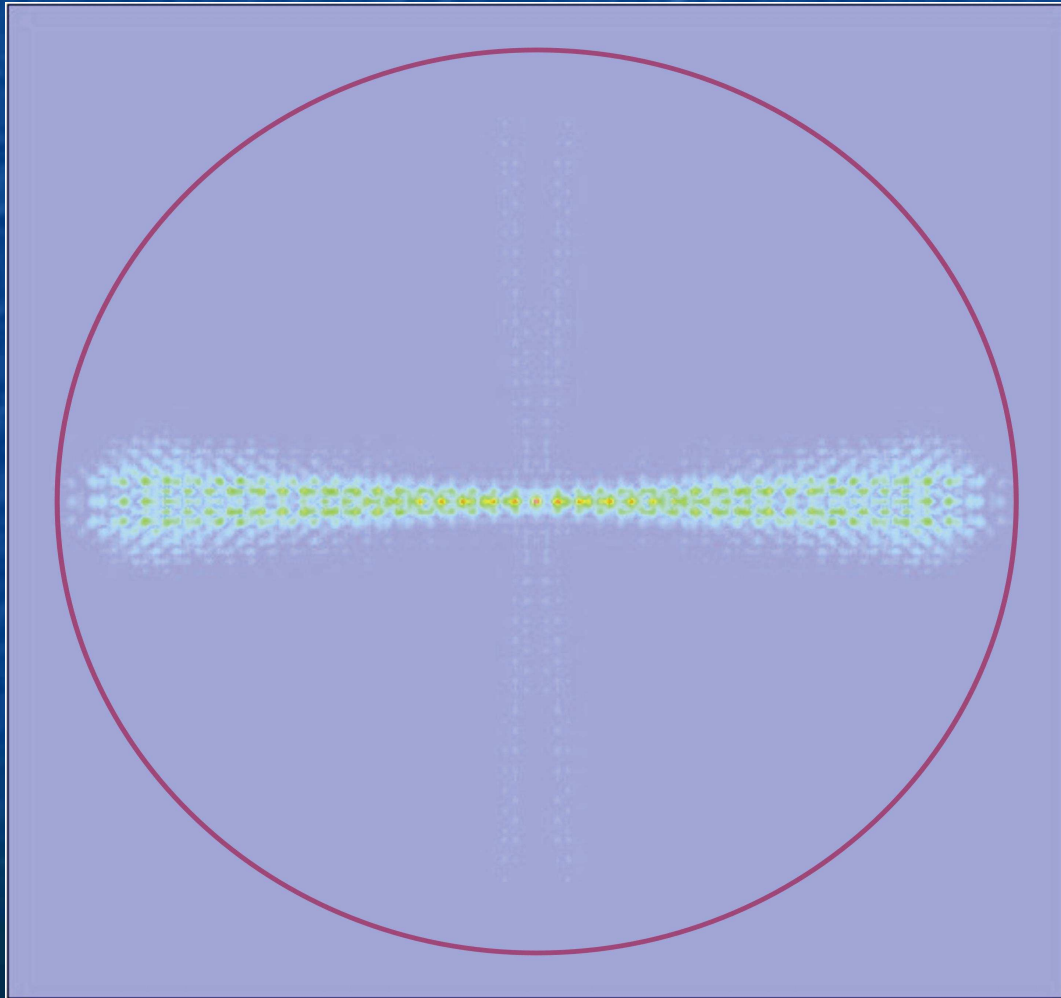
branch b5



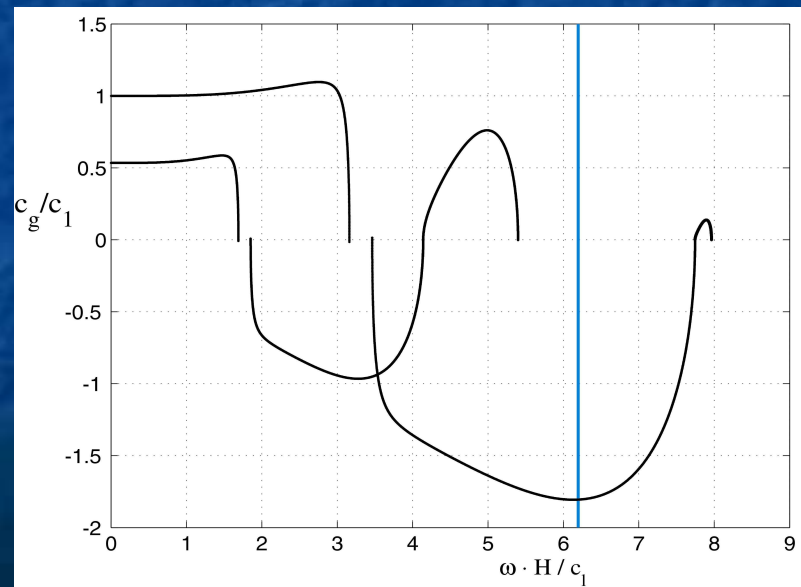
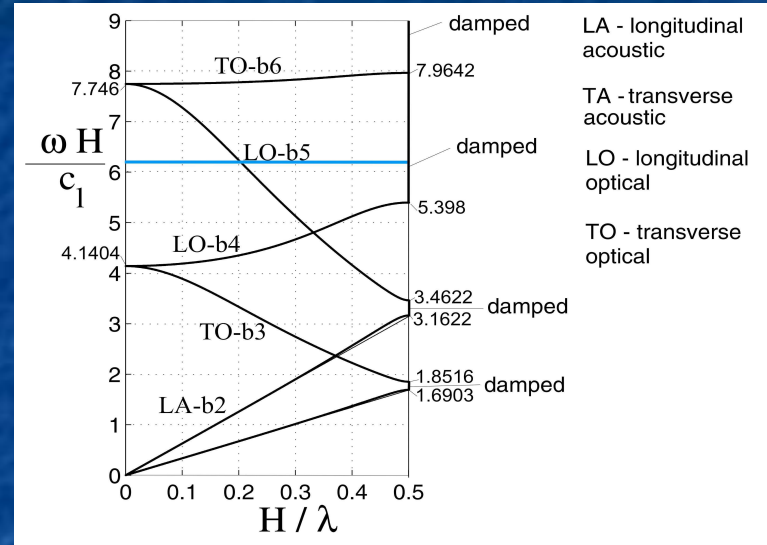
$$\omega H / c_1 = 6.1$$



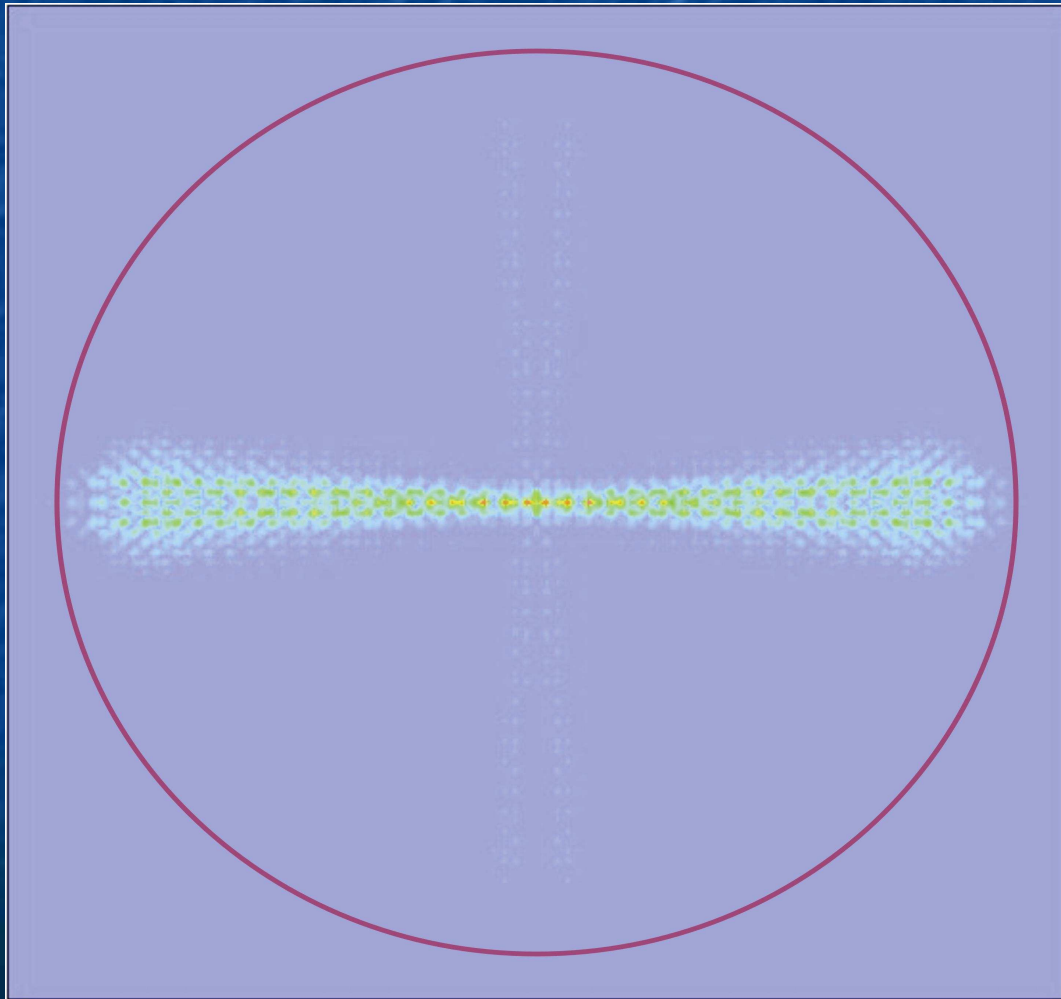
branch b5



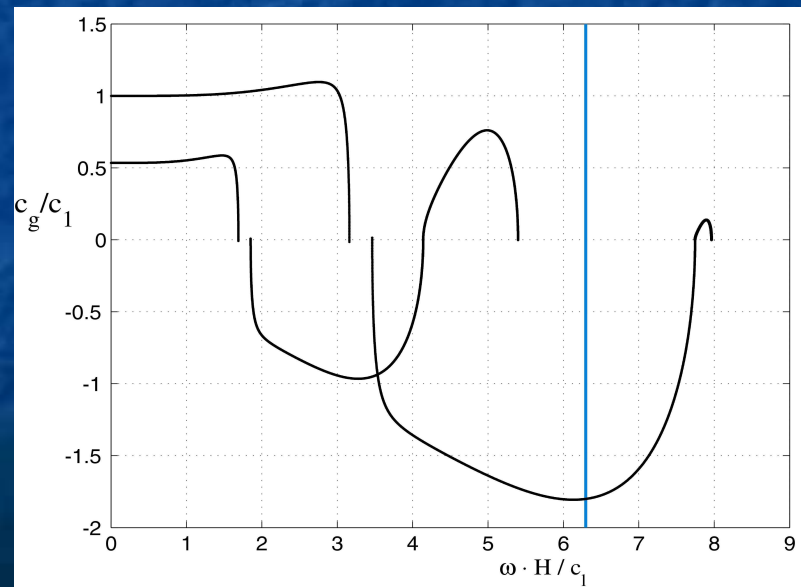
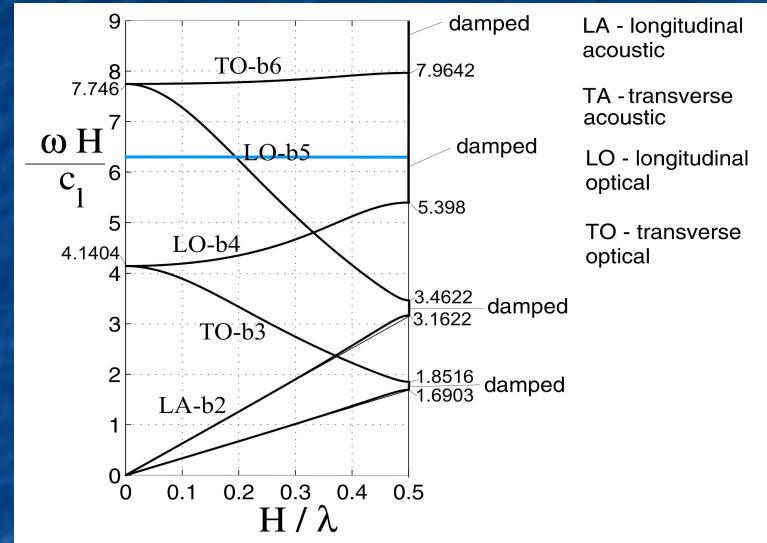
$$\omega H / c_1 = 6.2$$



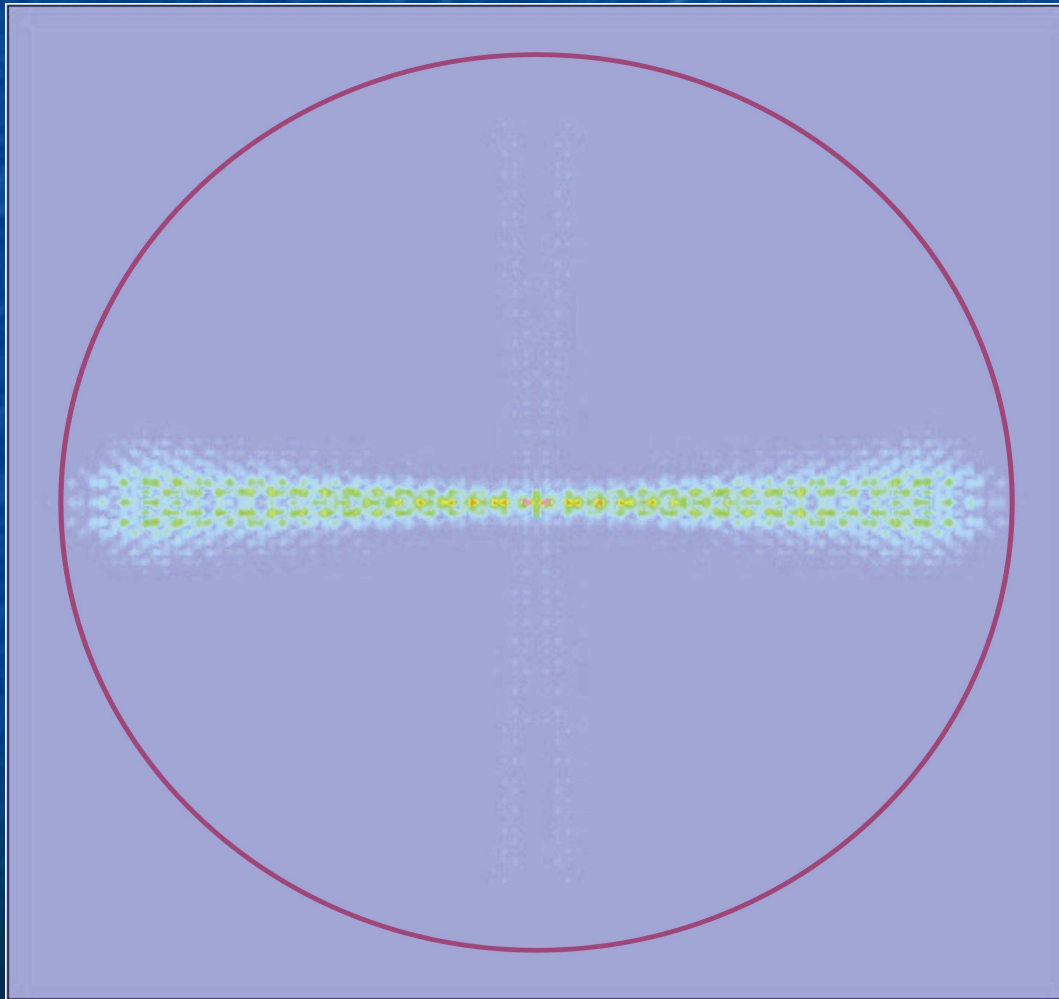
branch b5



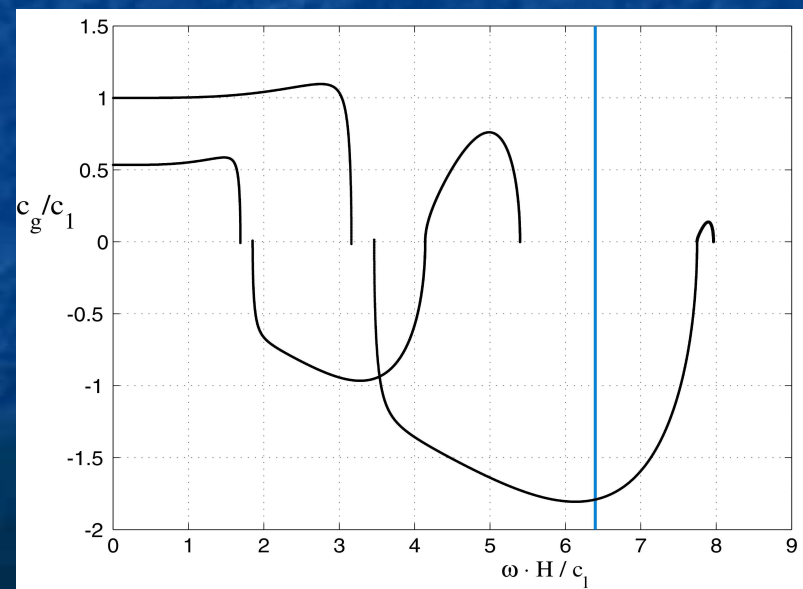
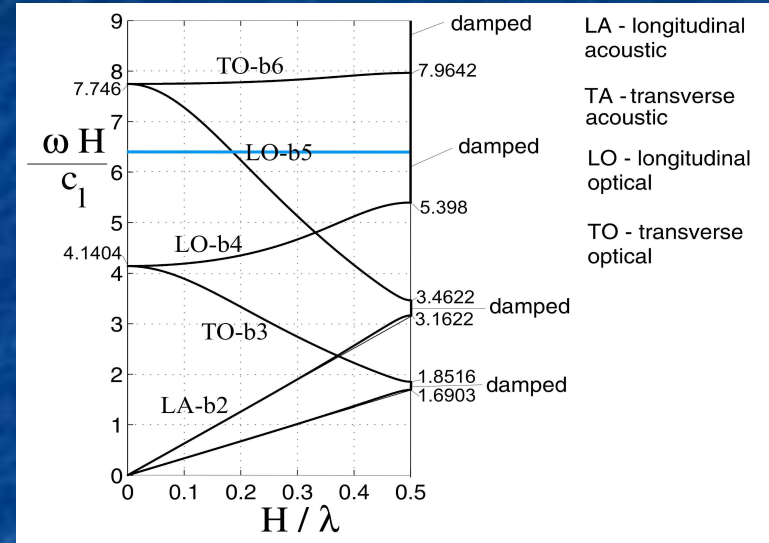
$$\omega H / c_1 = 6.3$$



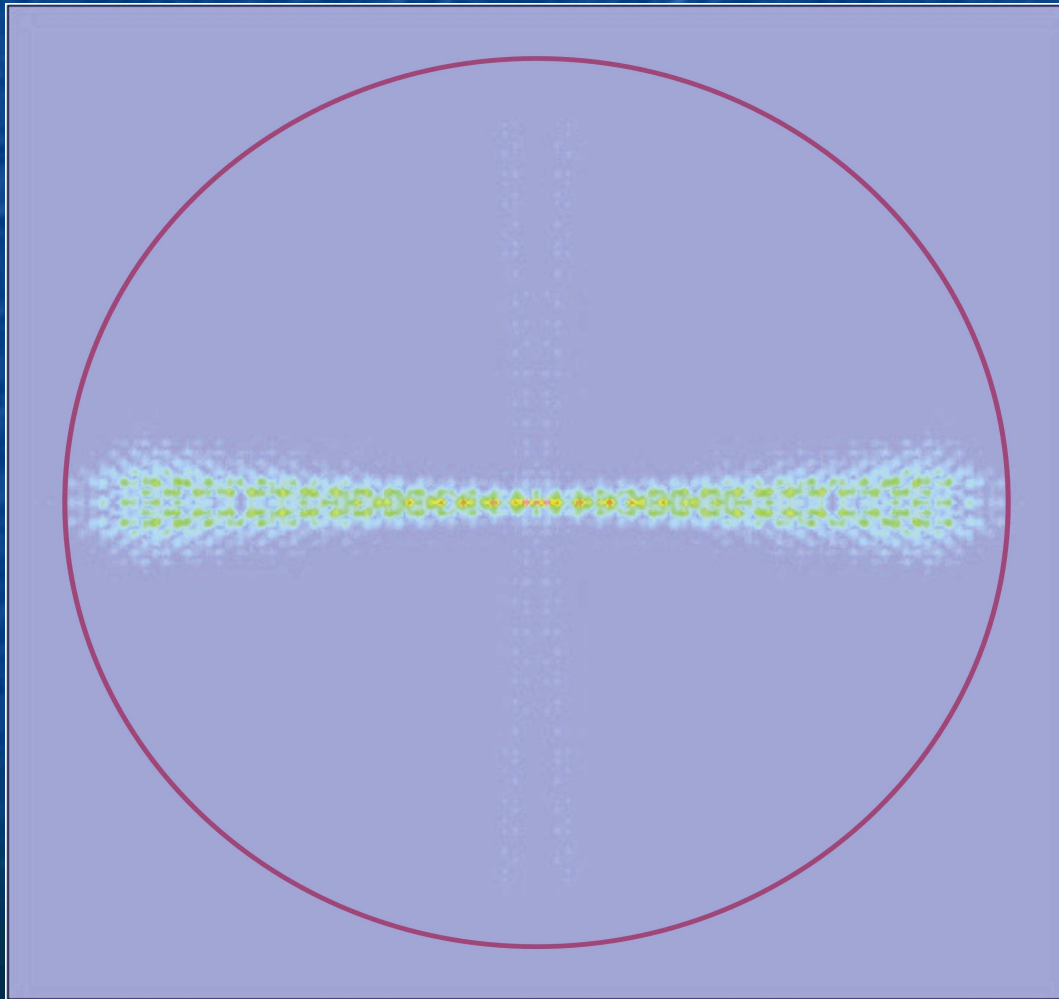
branch b5



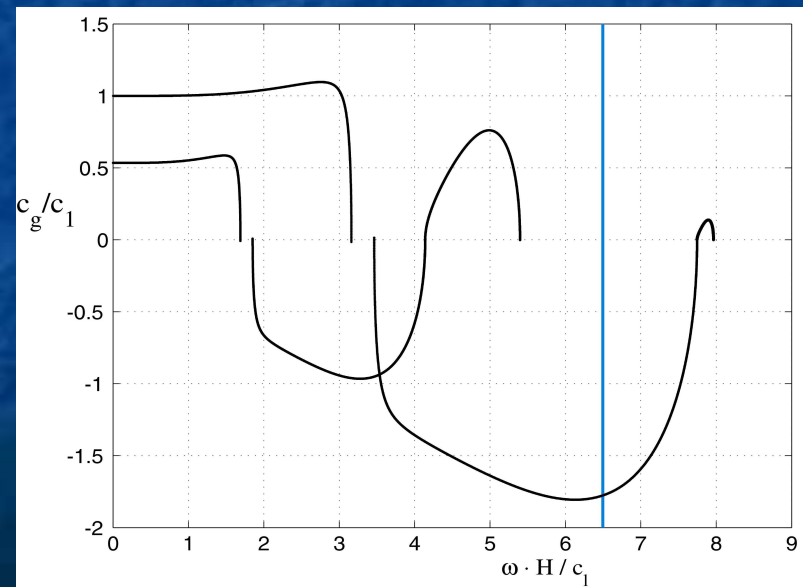
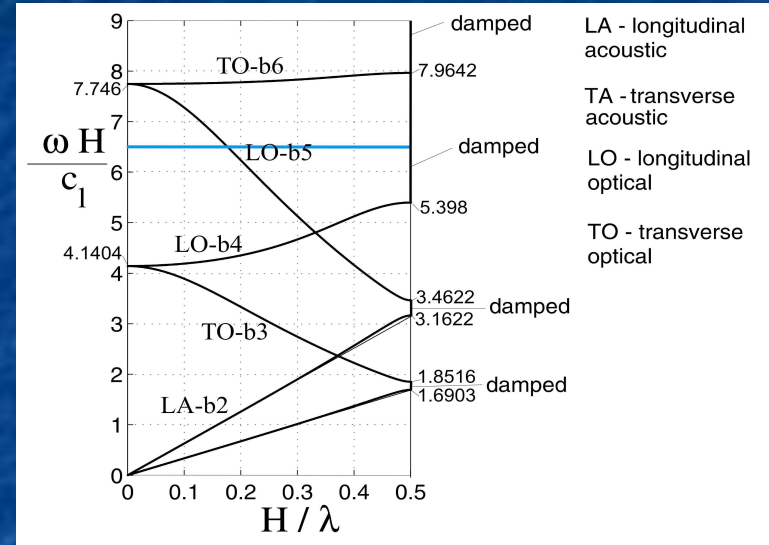
$$\omega H / c_1 = 6.4$$



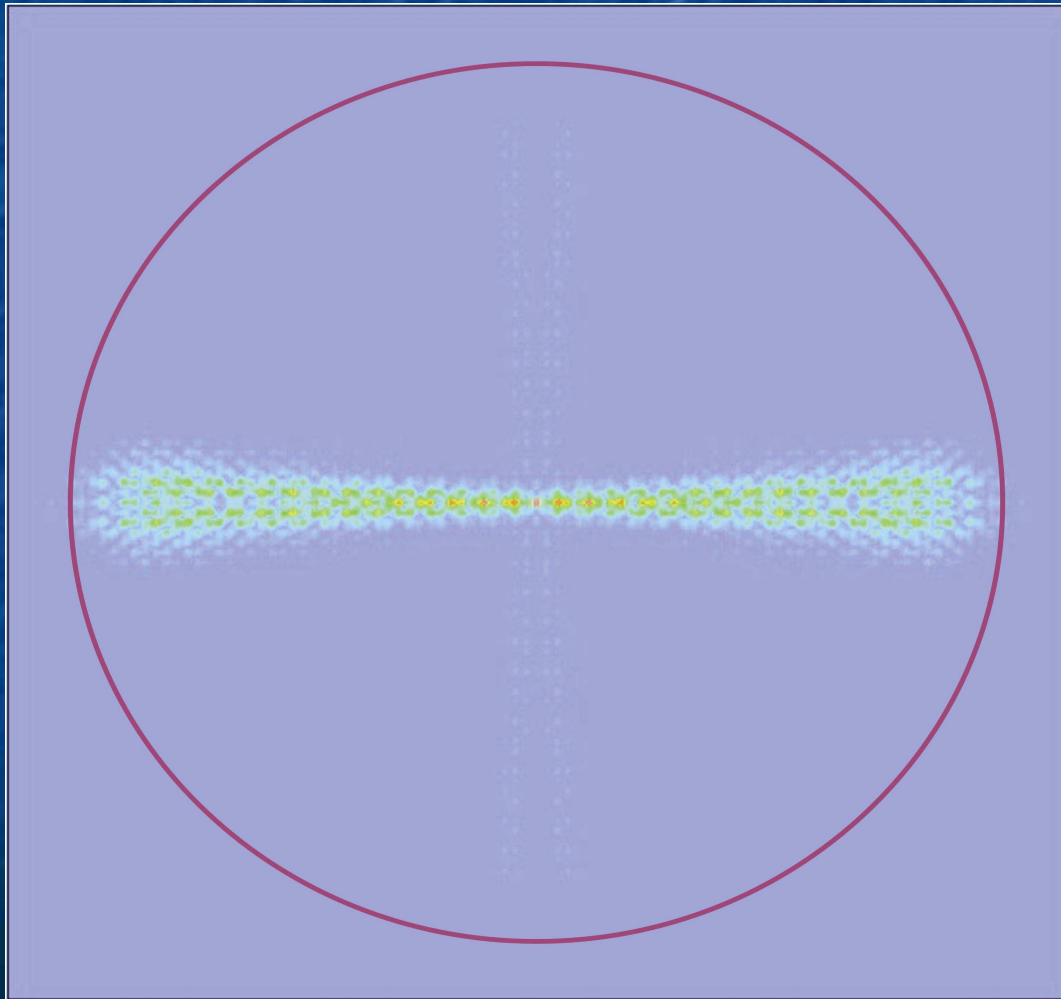
branch b5



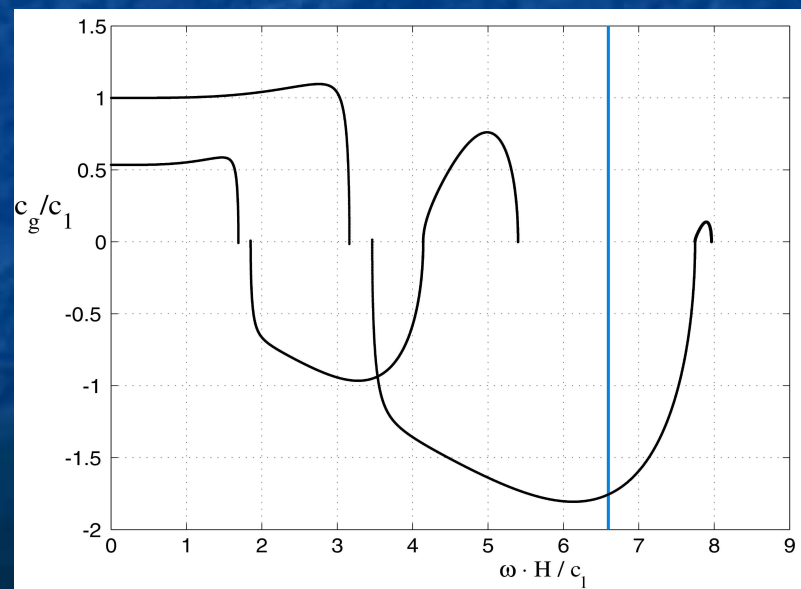
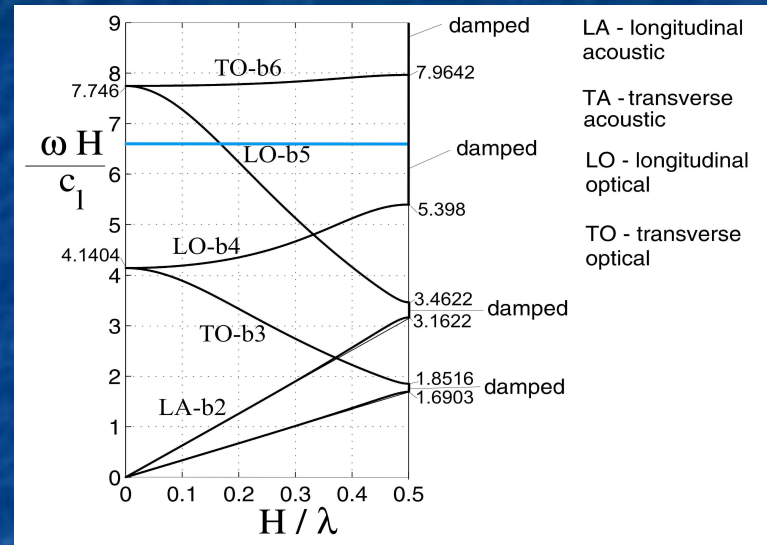
$$\omega H / c_1 = 6.5$$



branch b5



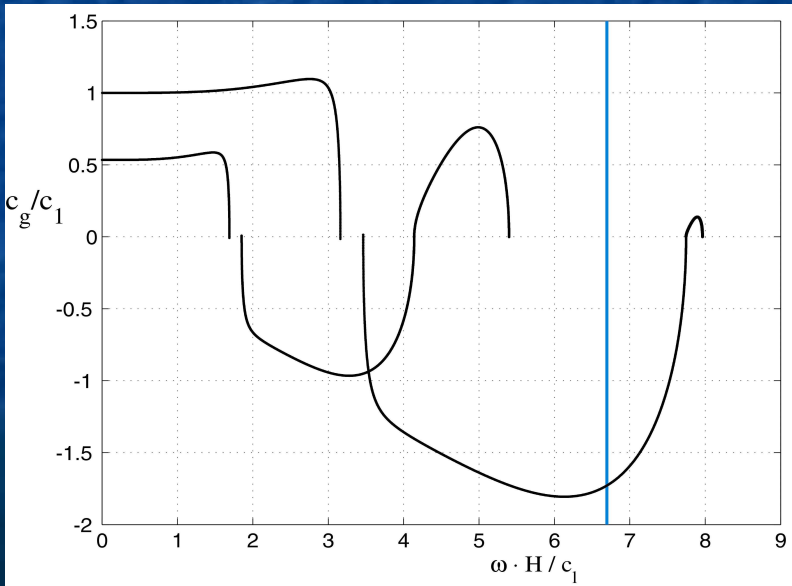
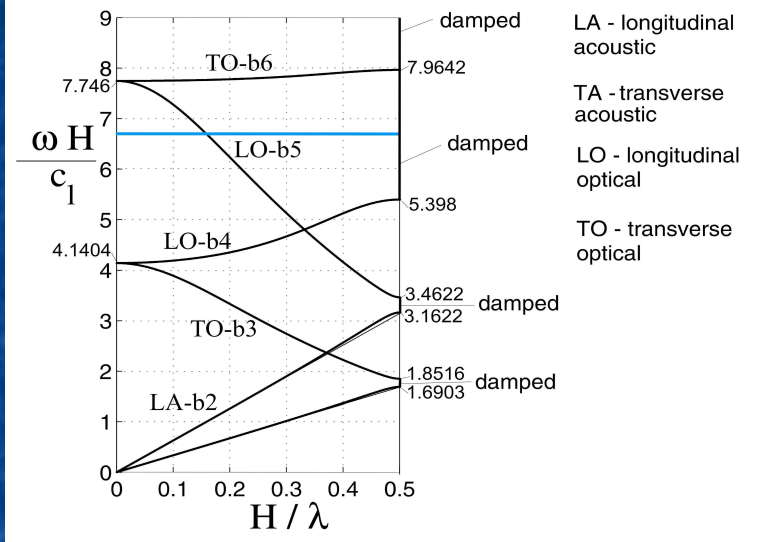
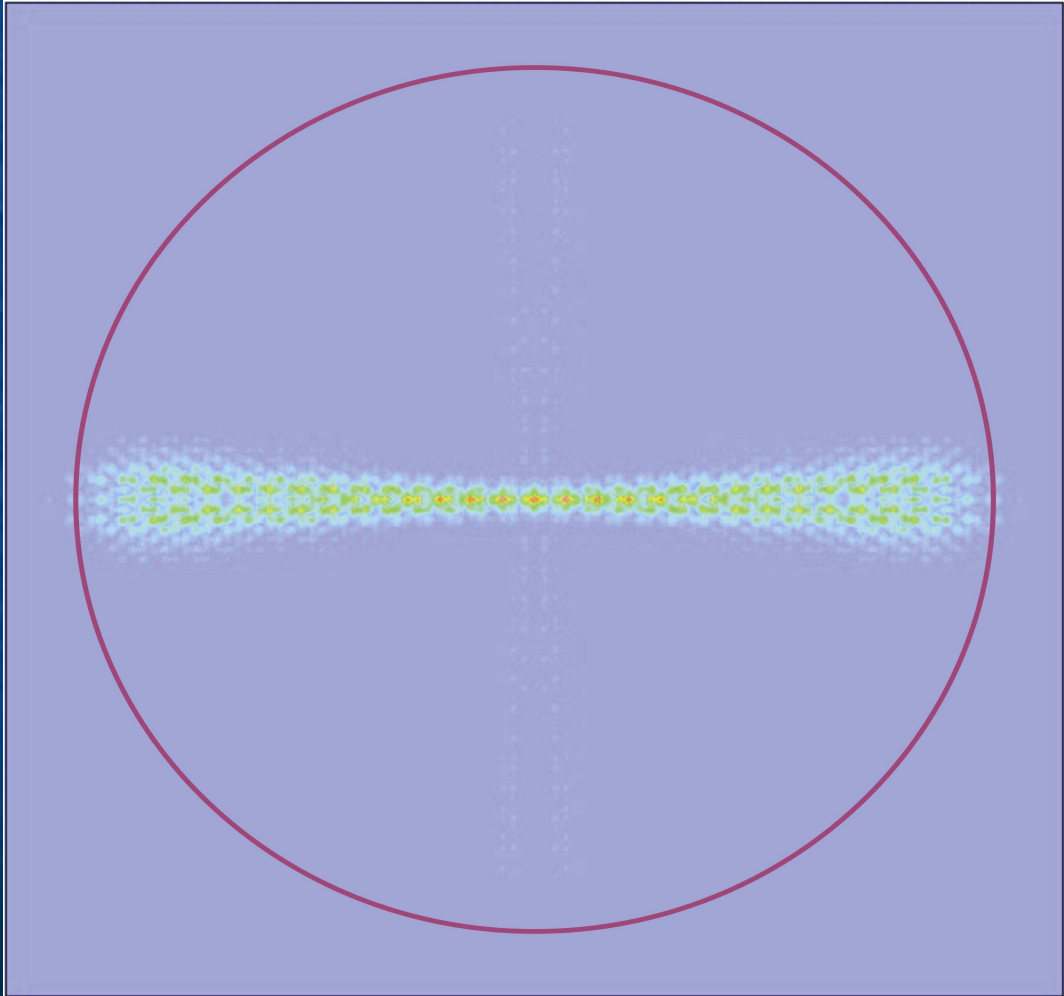
$$\omega H / c_1 = 6.6$$



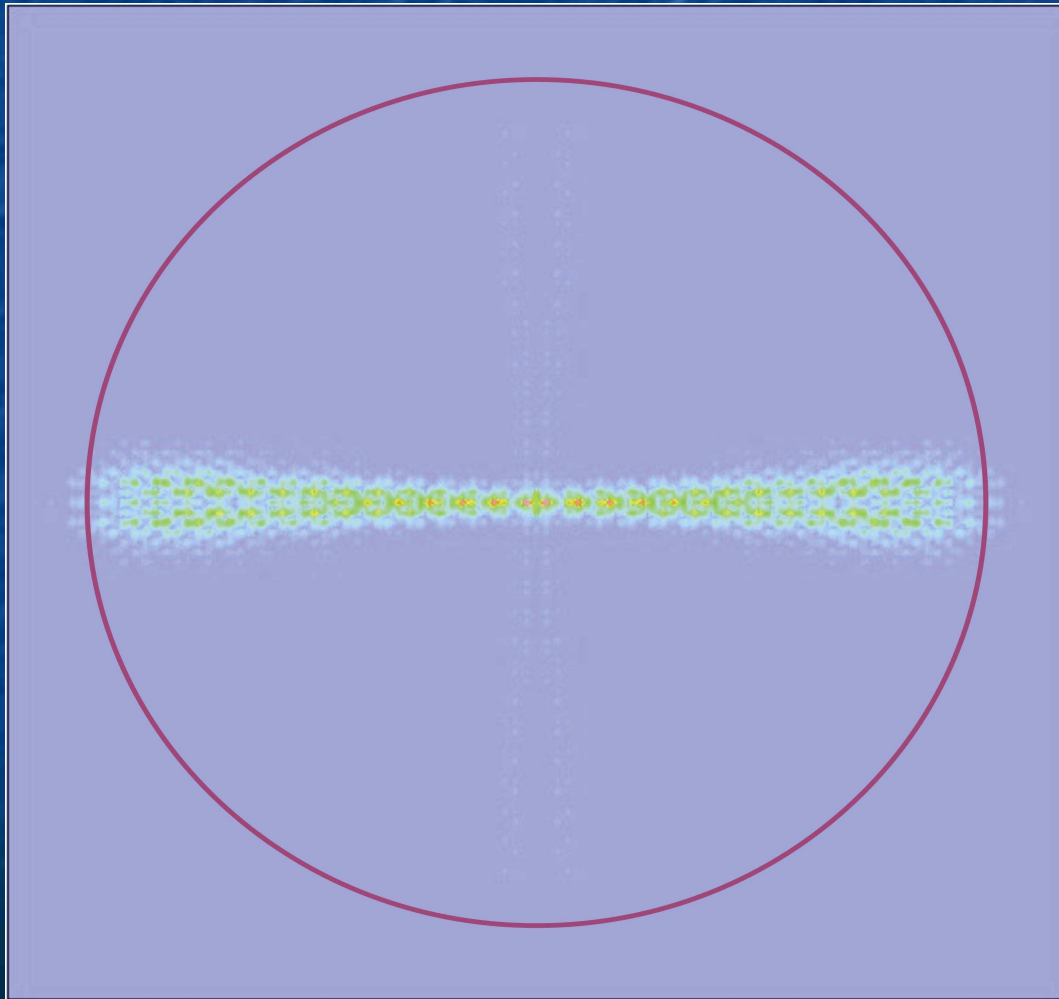
branch b5



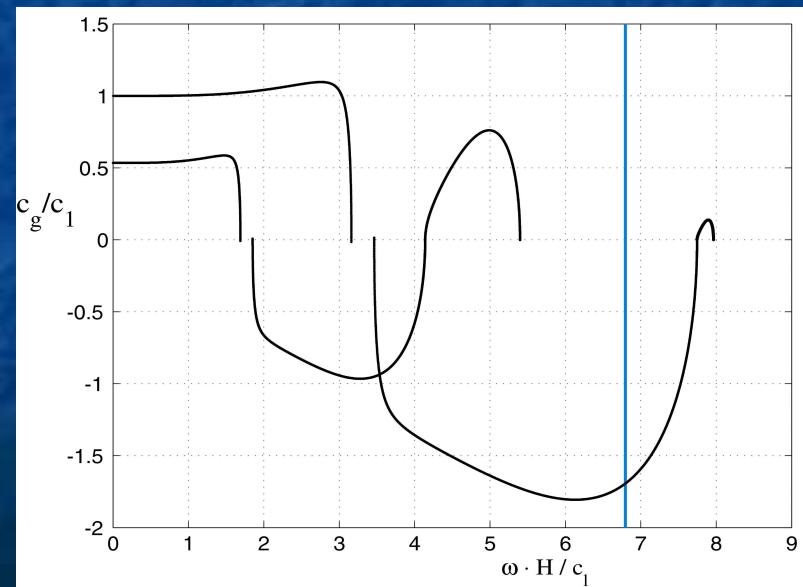
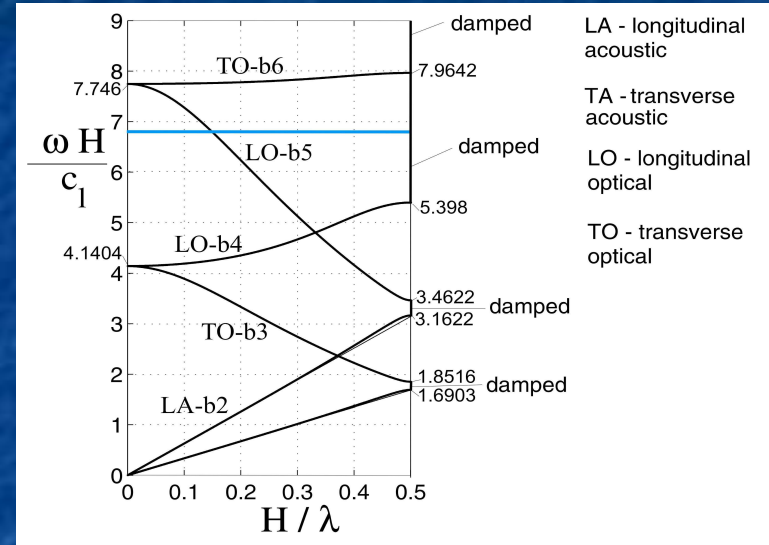
$$\omega H / c_1 = 6.7$$



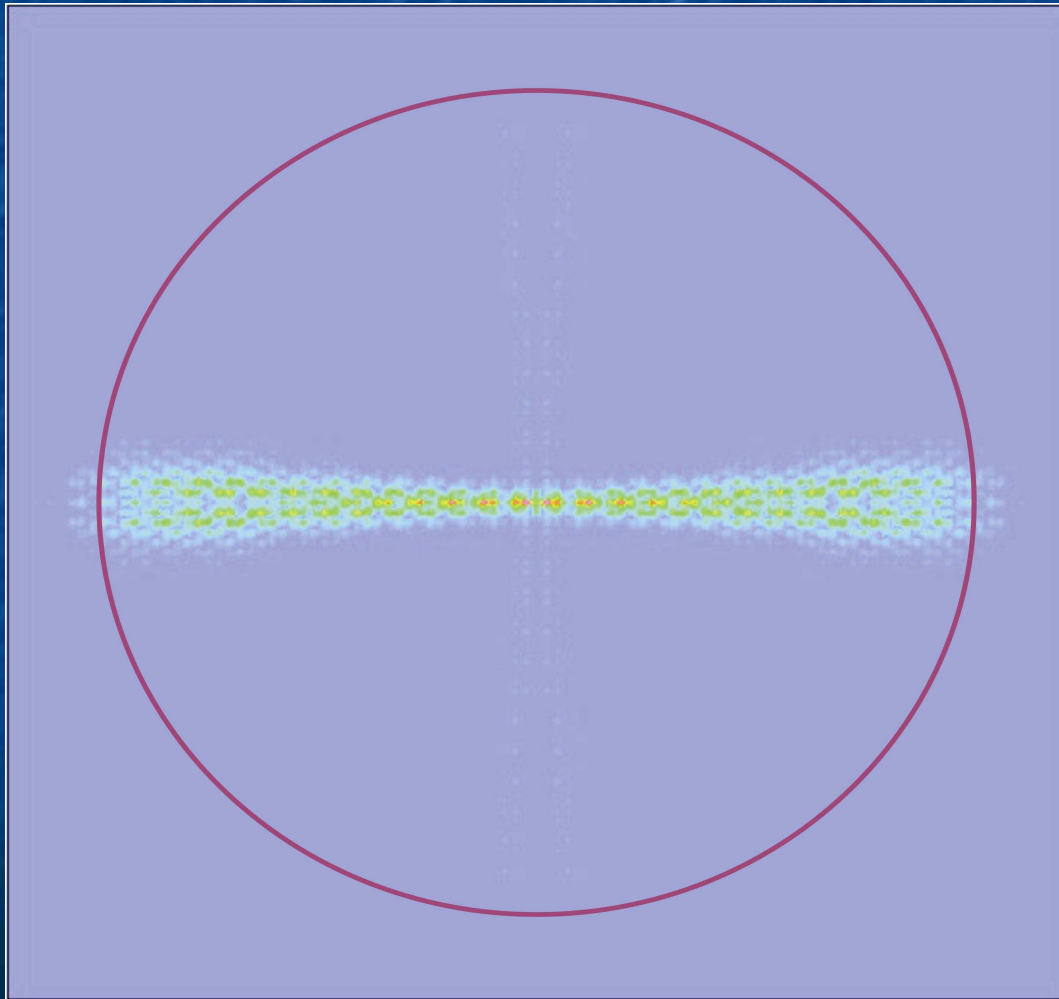
branch b5



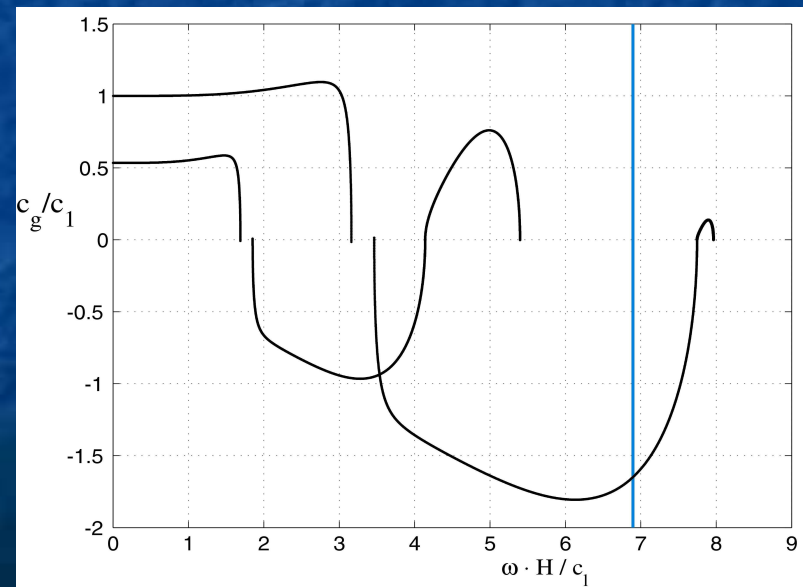
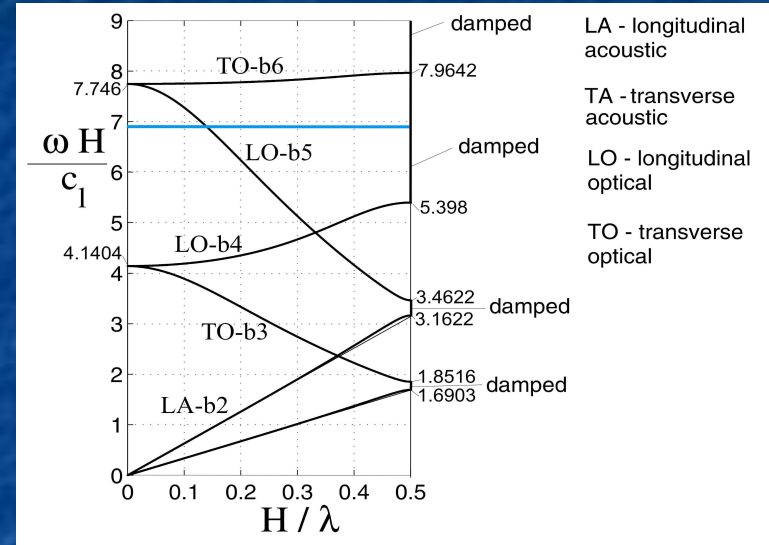
$$\omega H / c_1 = 6.8$$



branch b5



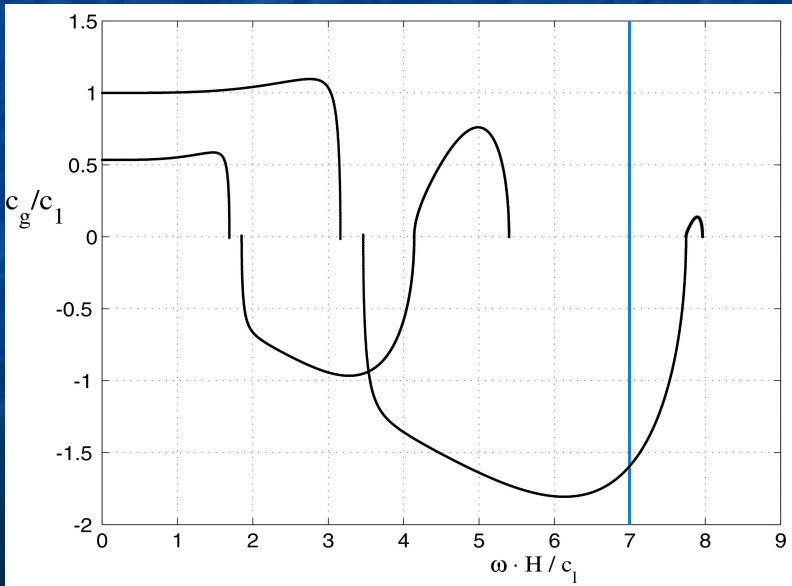
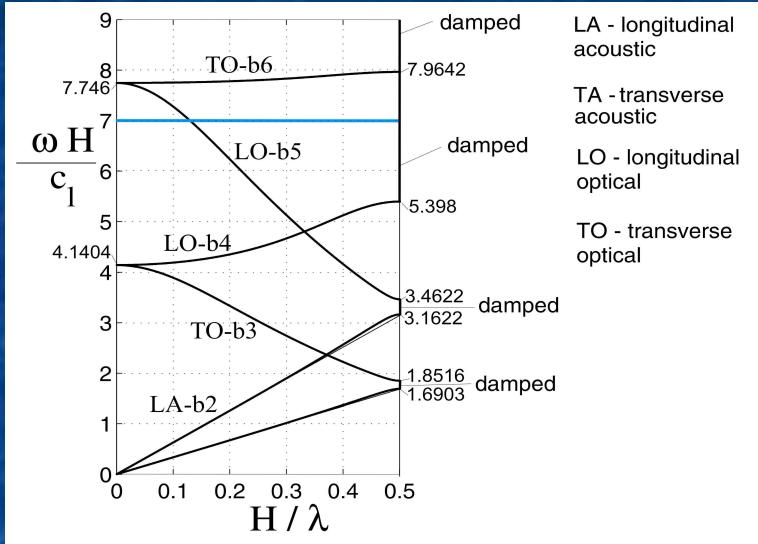
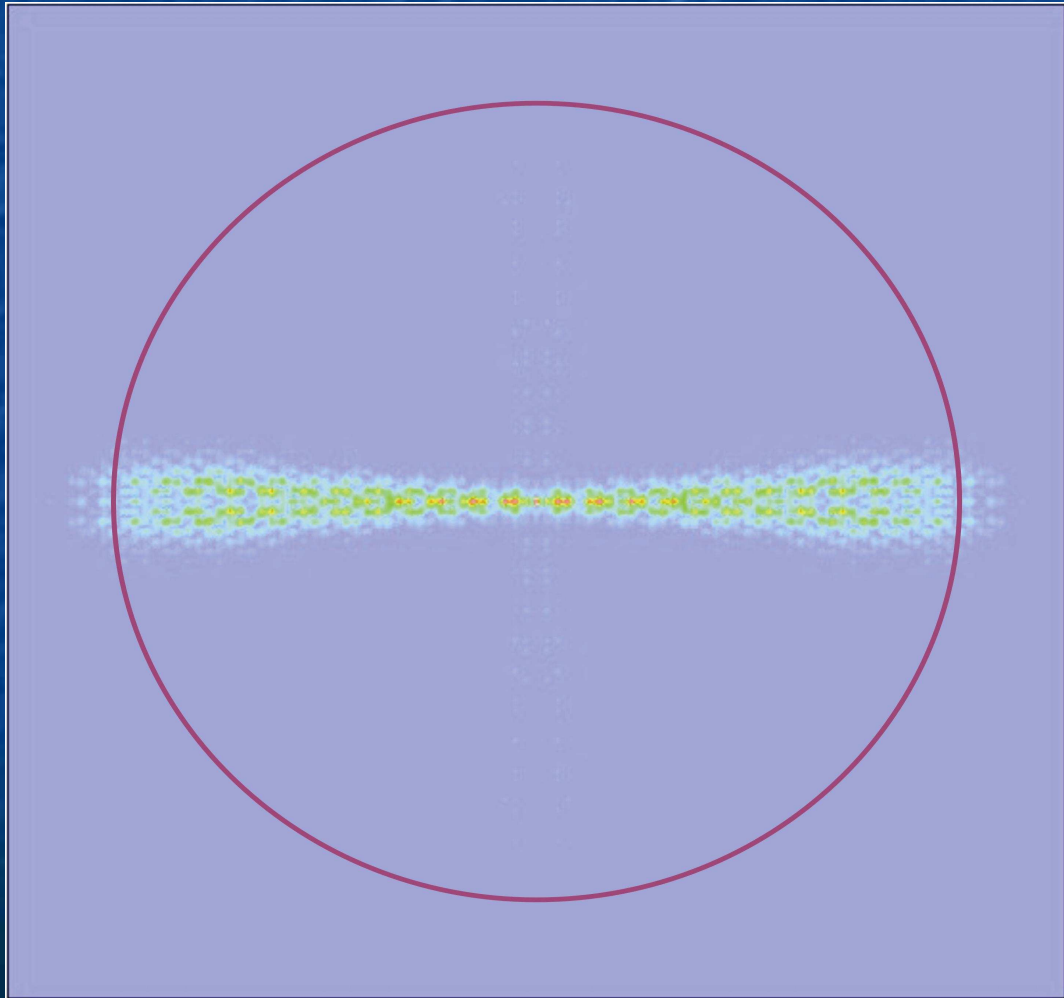
$$\omega H / c_1 = 6.9$$



branch b5



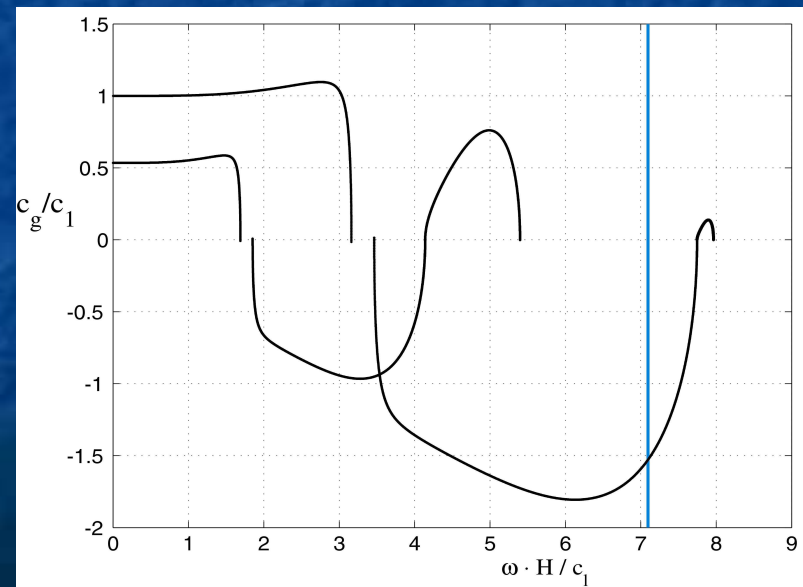
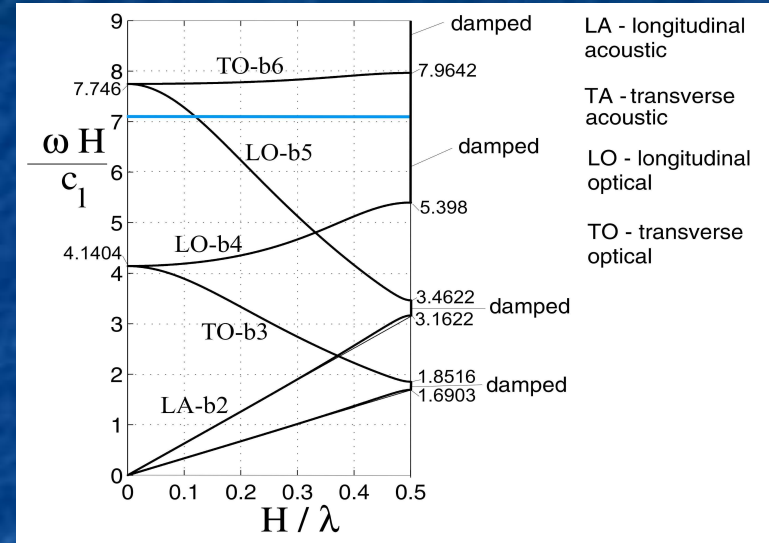
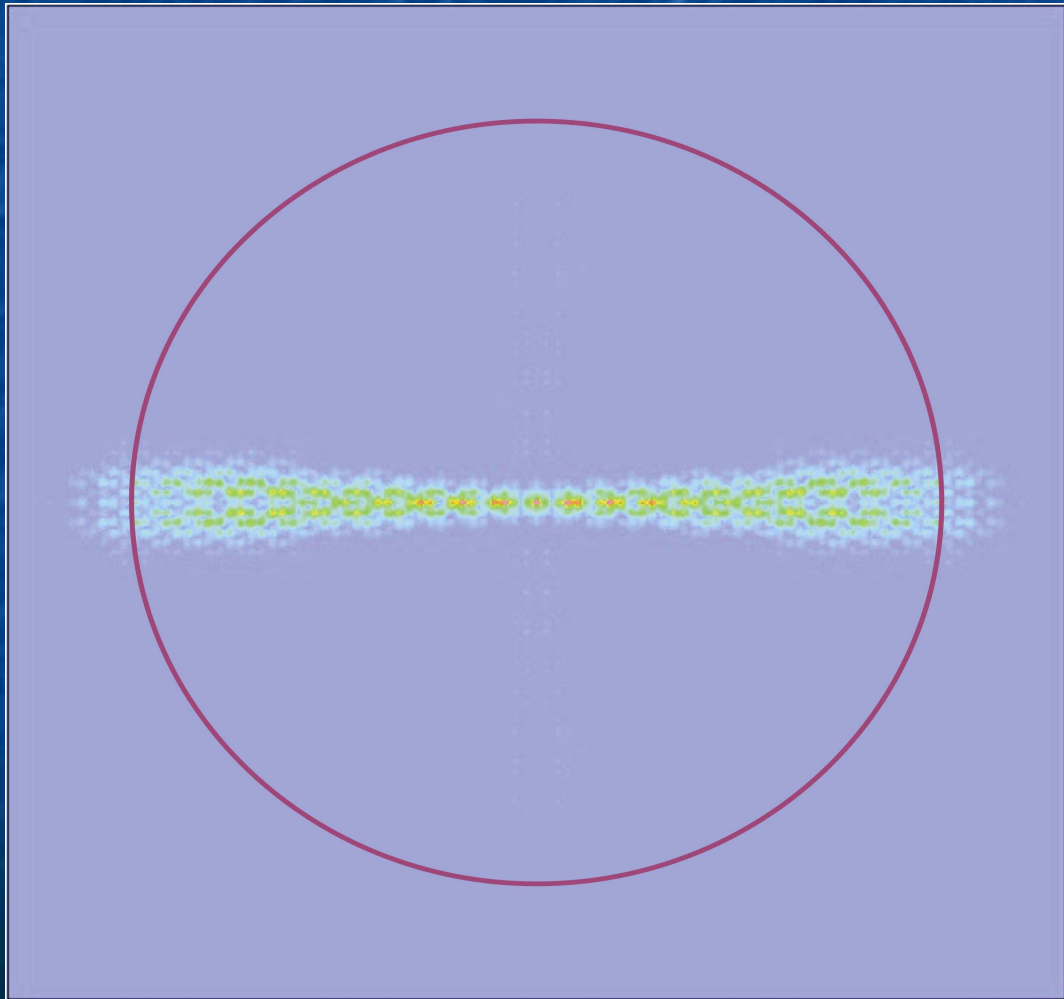
$$\omega H / c_1 = 7.0$$



branch b5



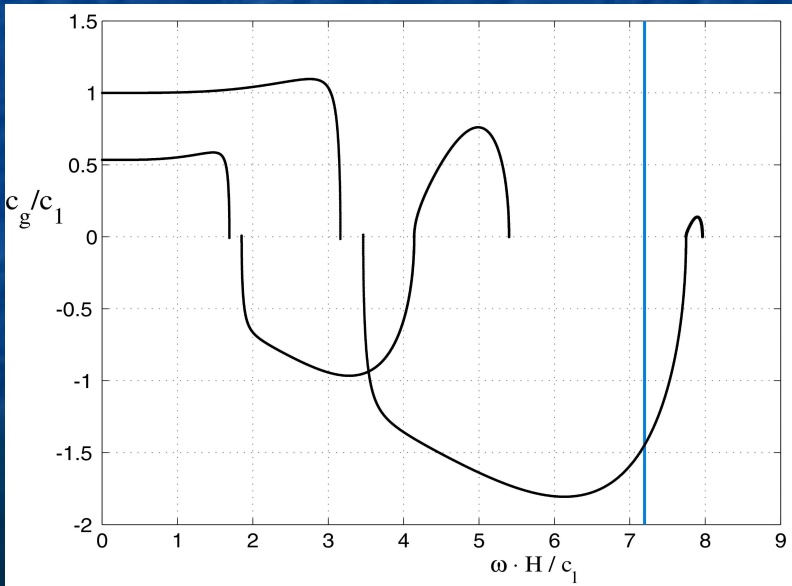
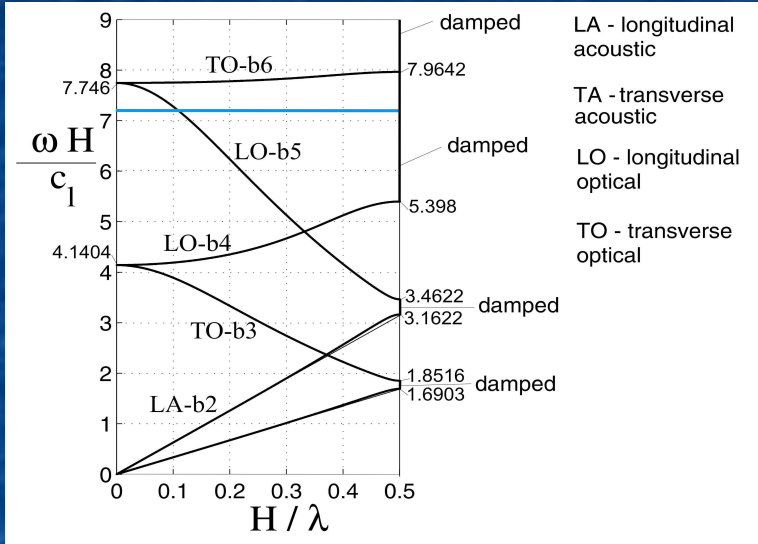
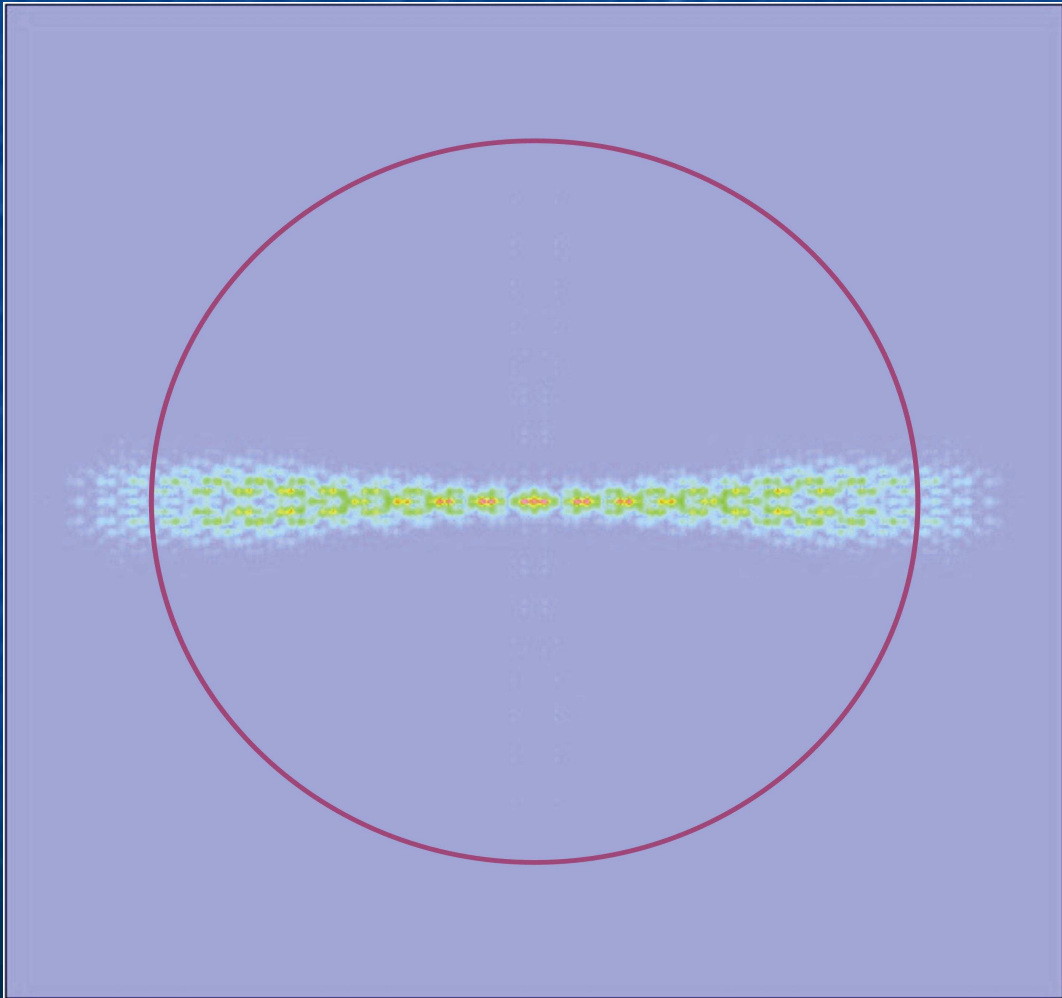
$$\omega H / c_1 = 7.1$$



branch b5



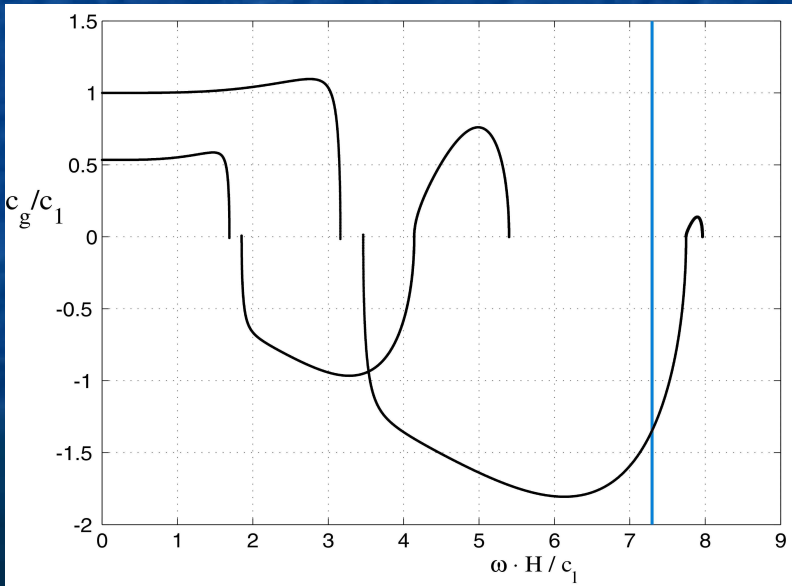
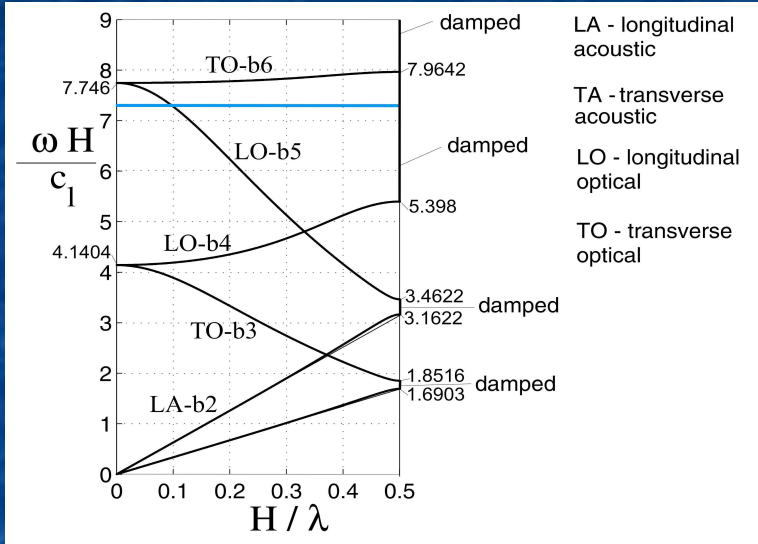
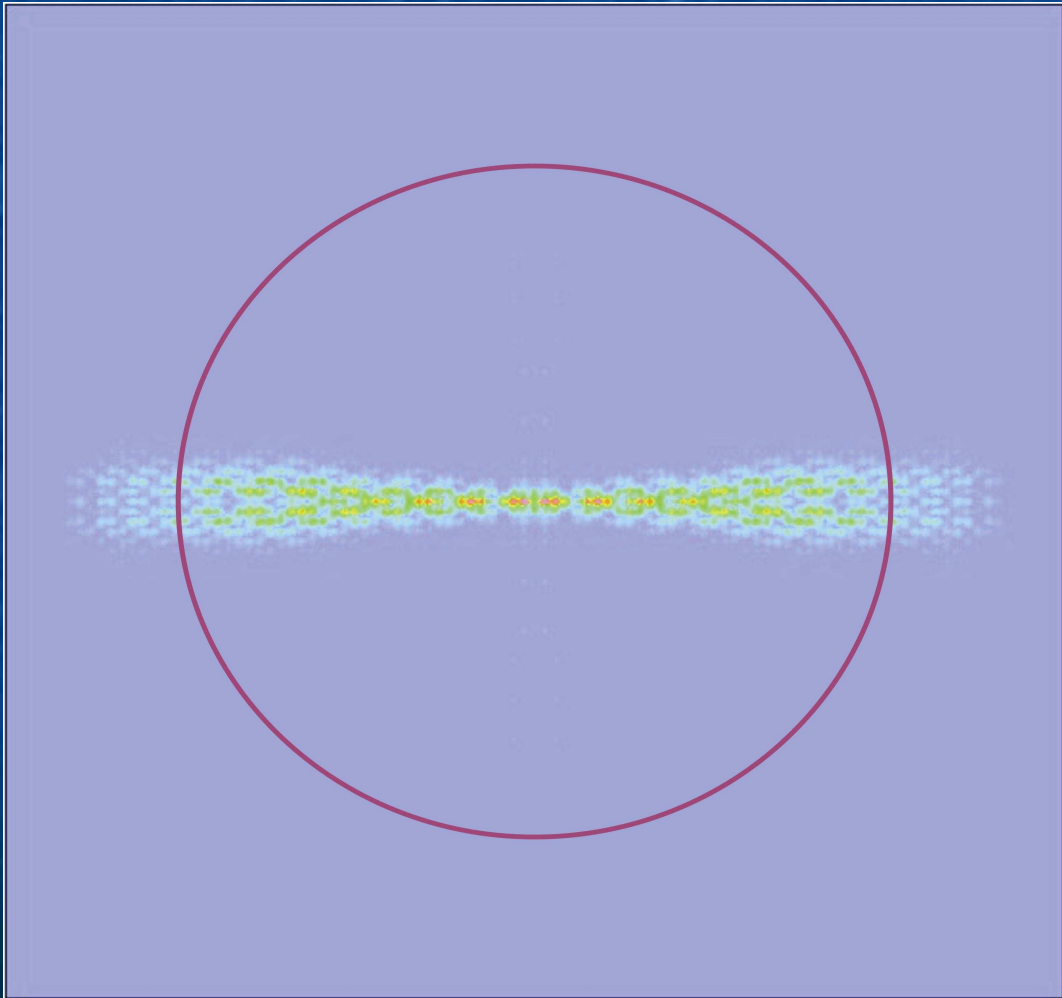
$$\omega H / c_1 = 7.2$$



branch b5



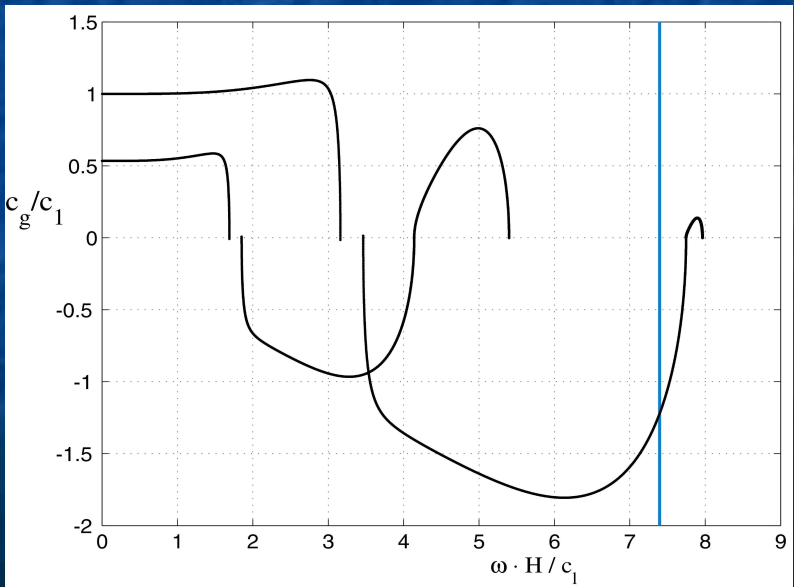
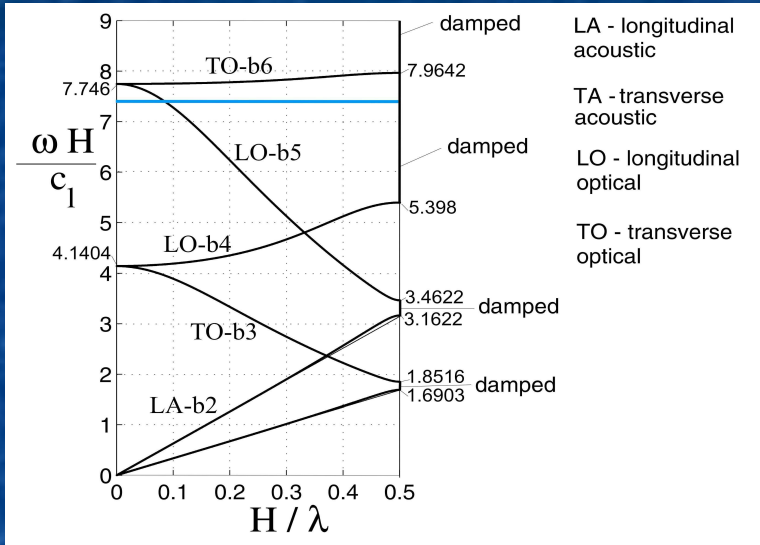
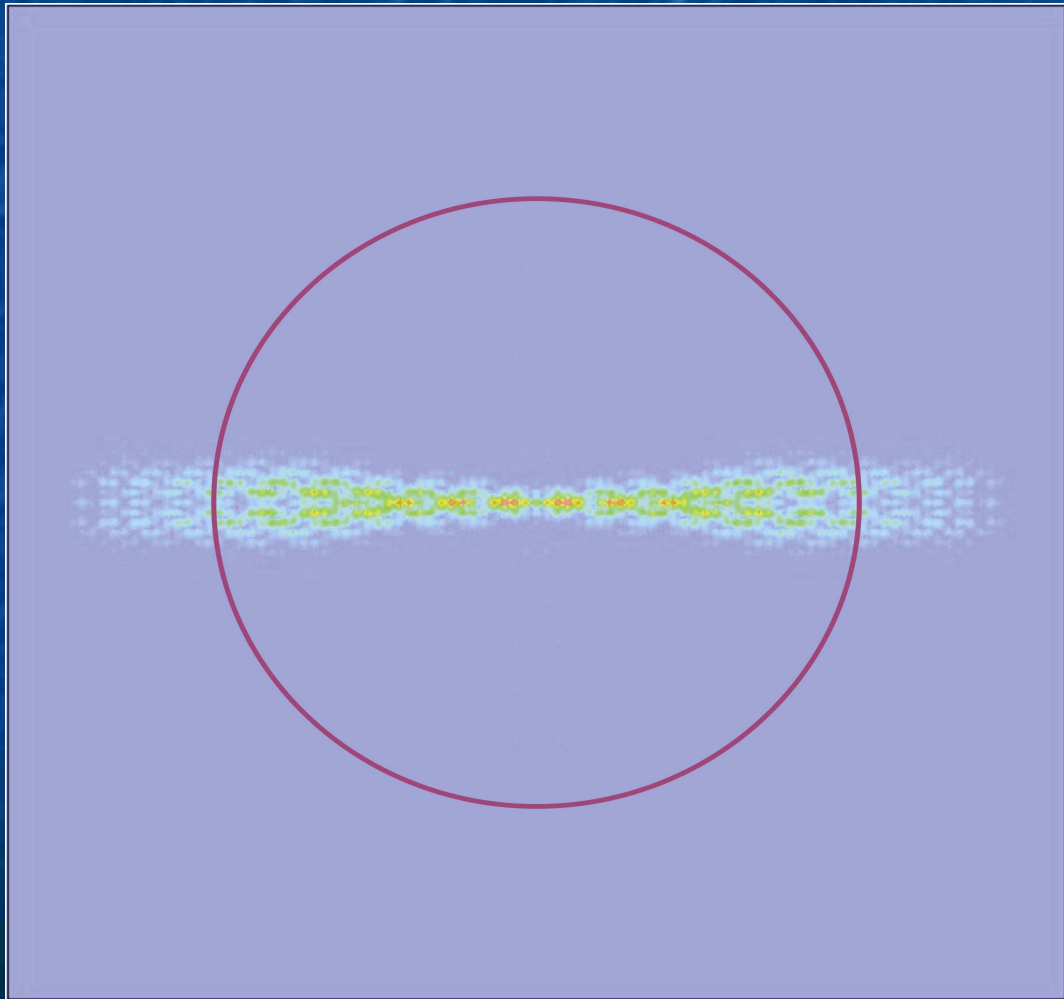
$$\omega H / c_1 = 7.3$$



branch b5



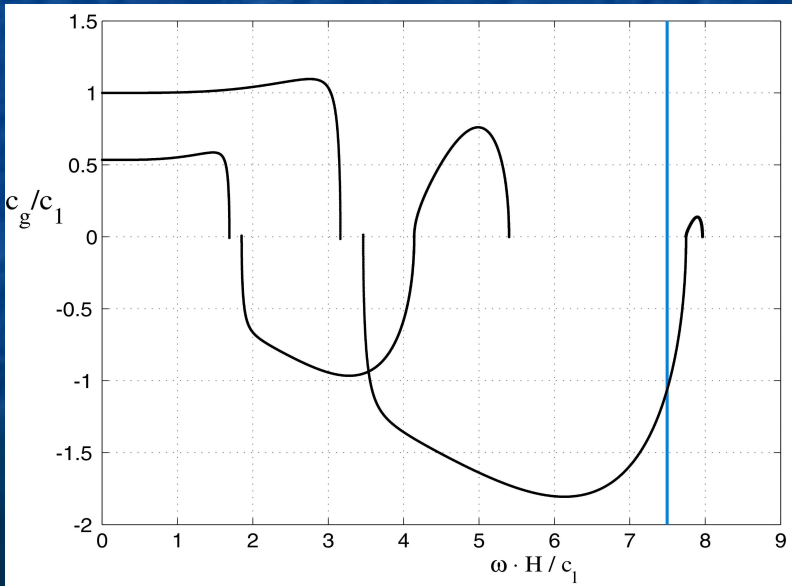
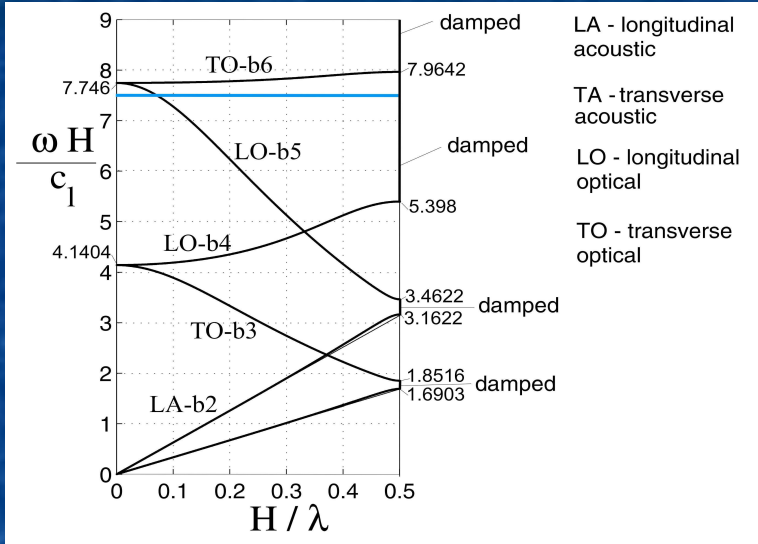
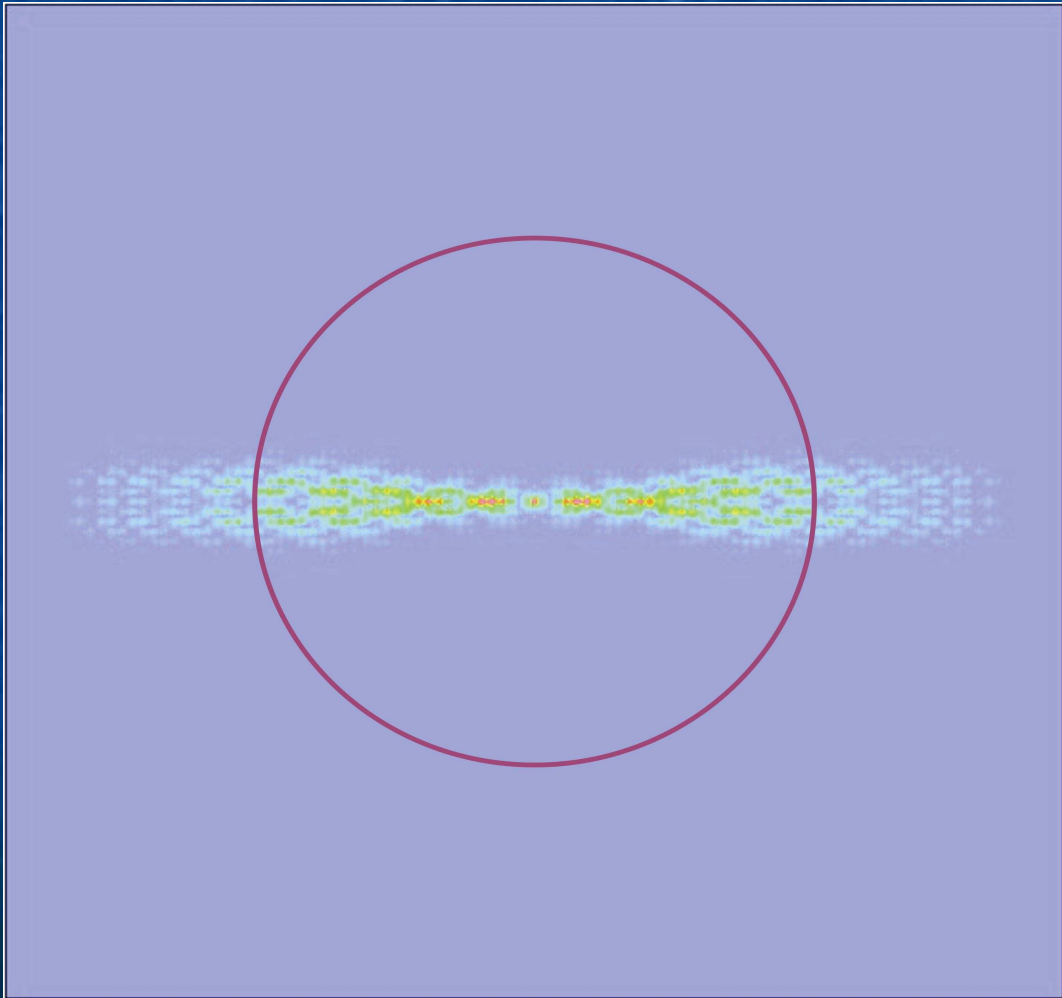
$$\omega H / c_1 = 7.4$$



branch b5



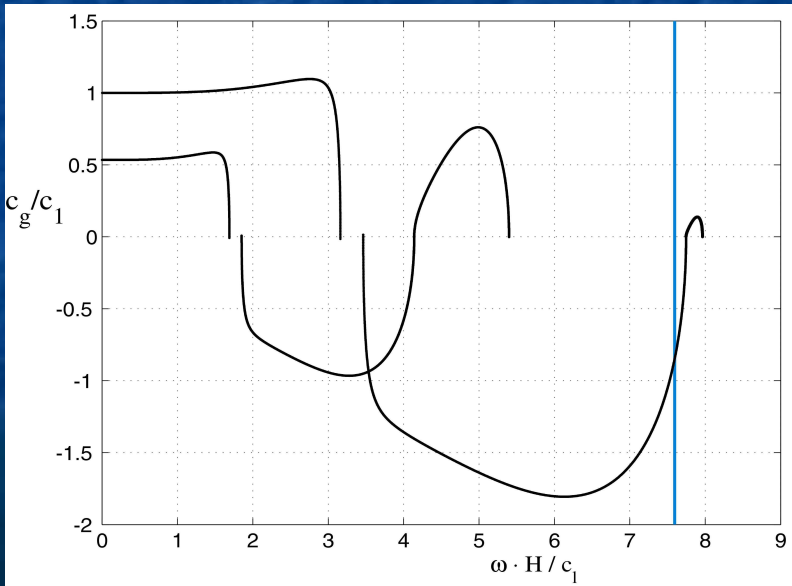
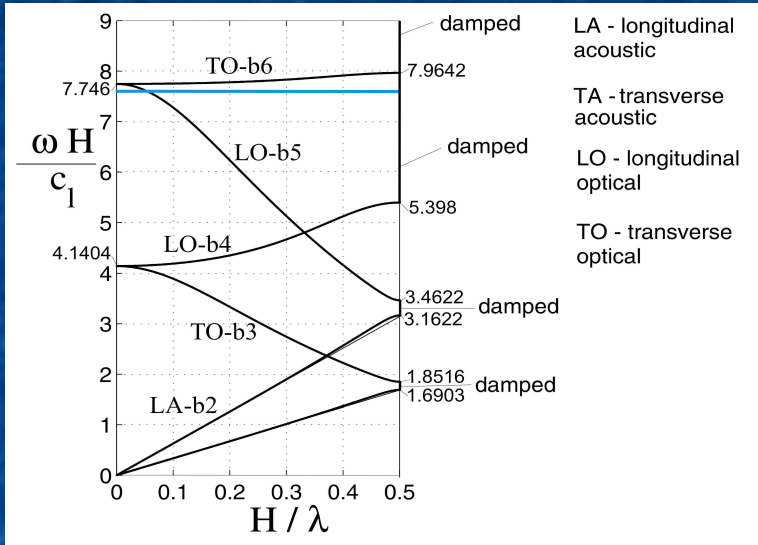
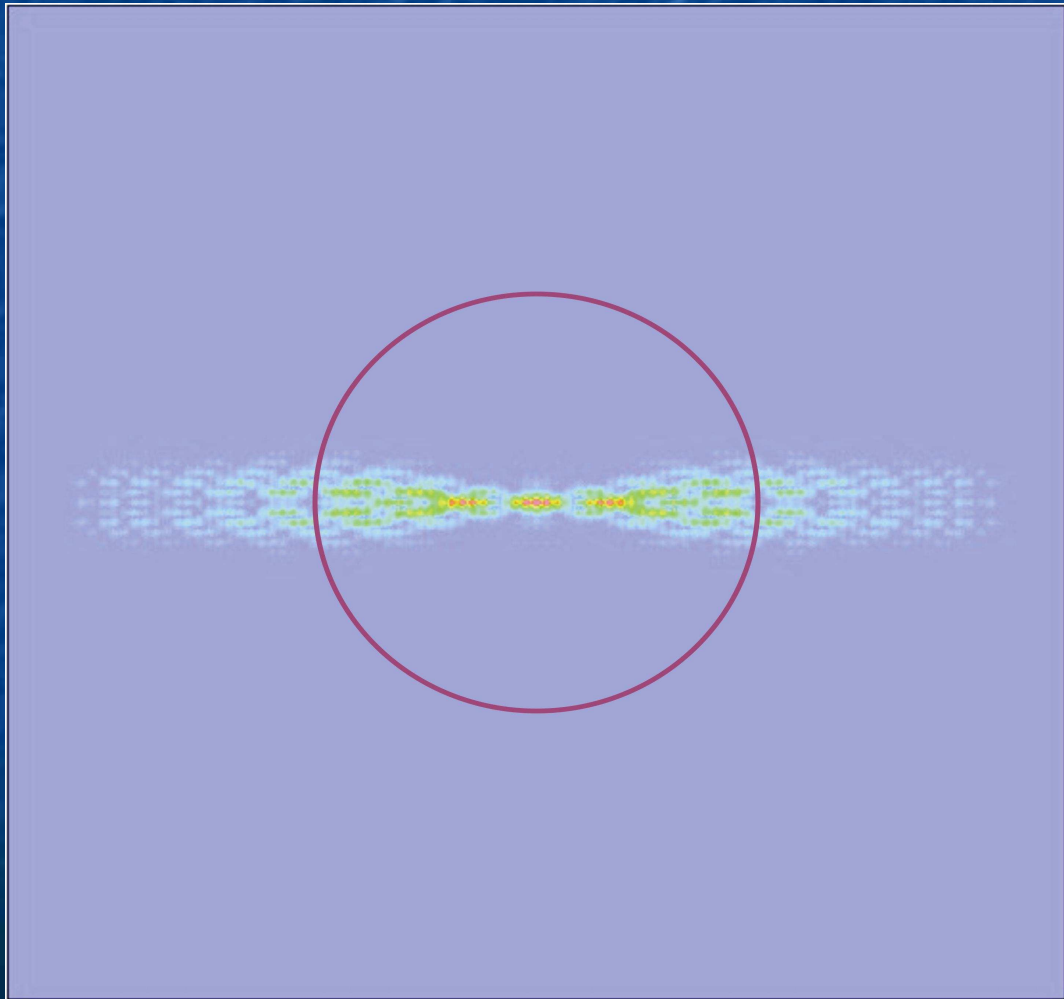
$$\omega H / c_1 = 7.5$$



branch b5



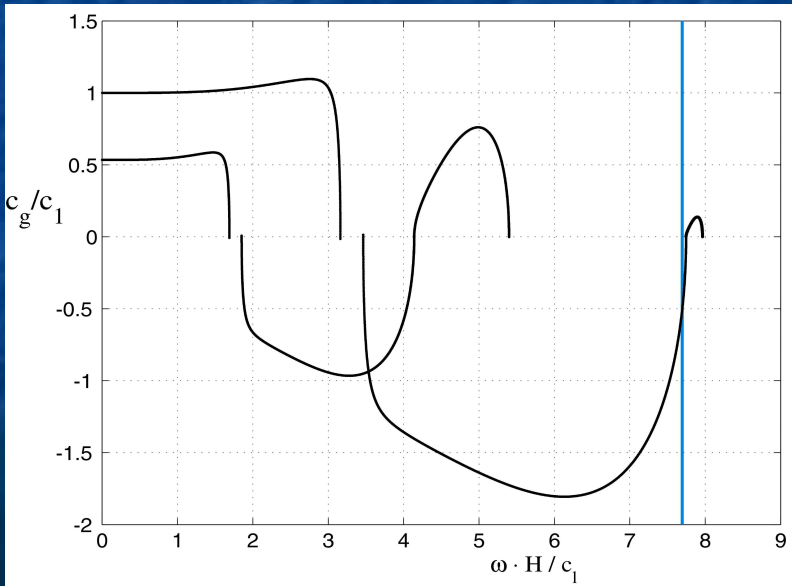
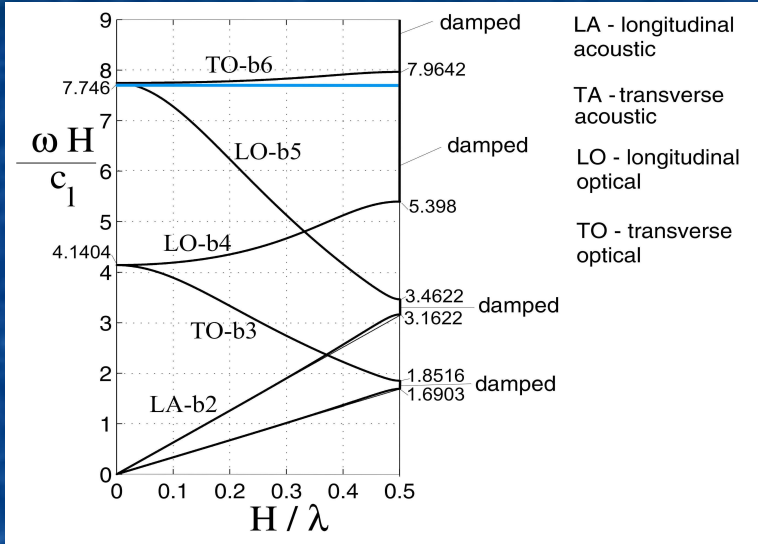
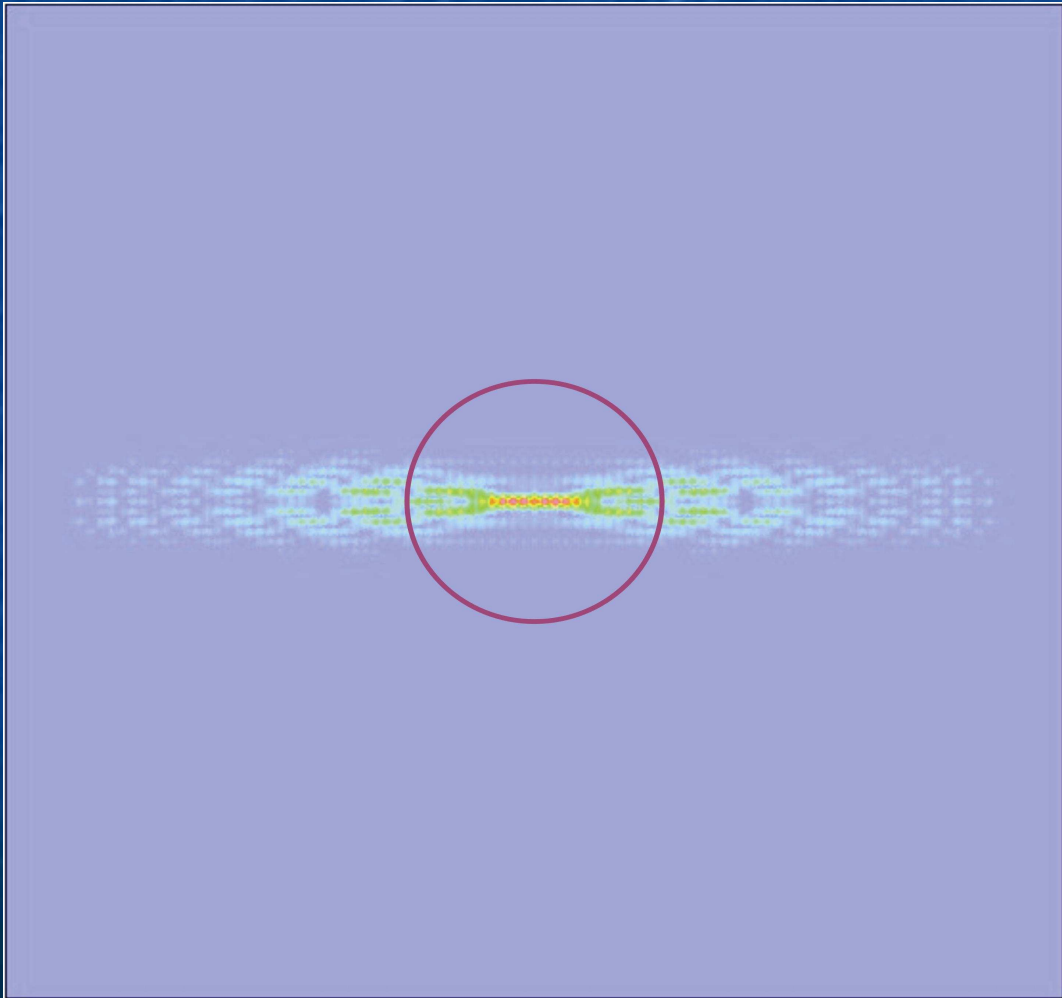
$$\omega H / c_1 = 7.6$$



branch b5

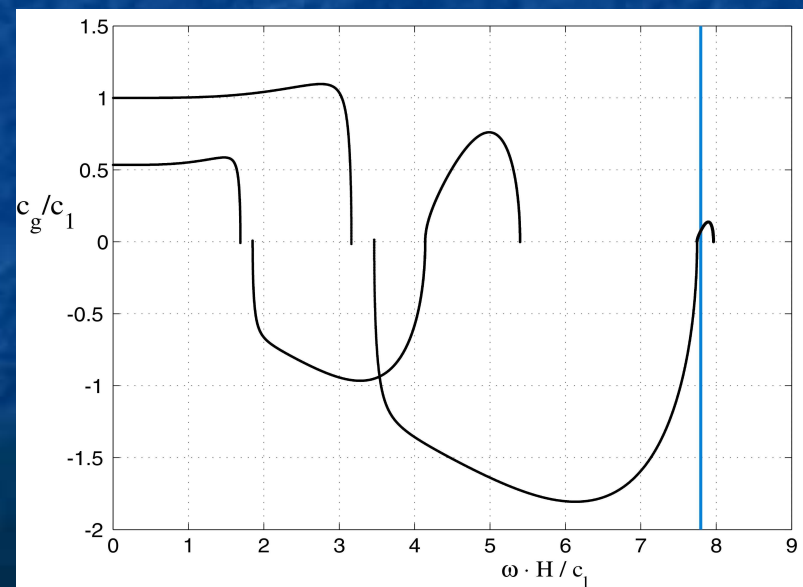
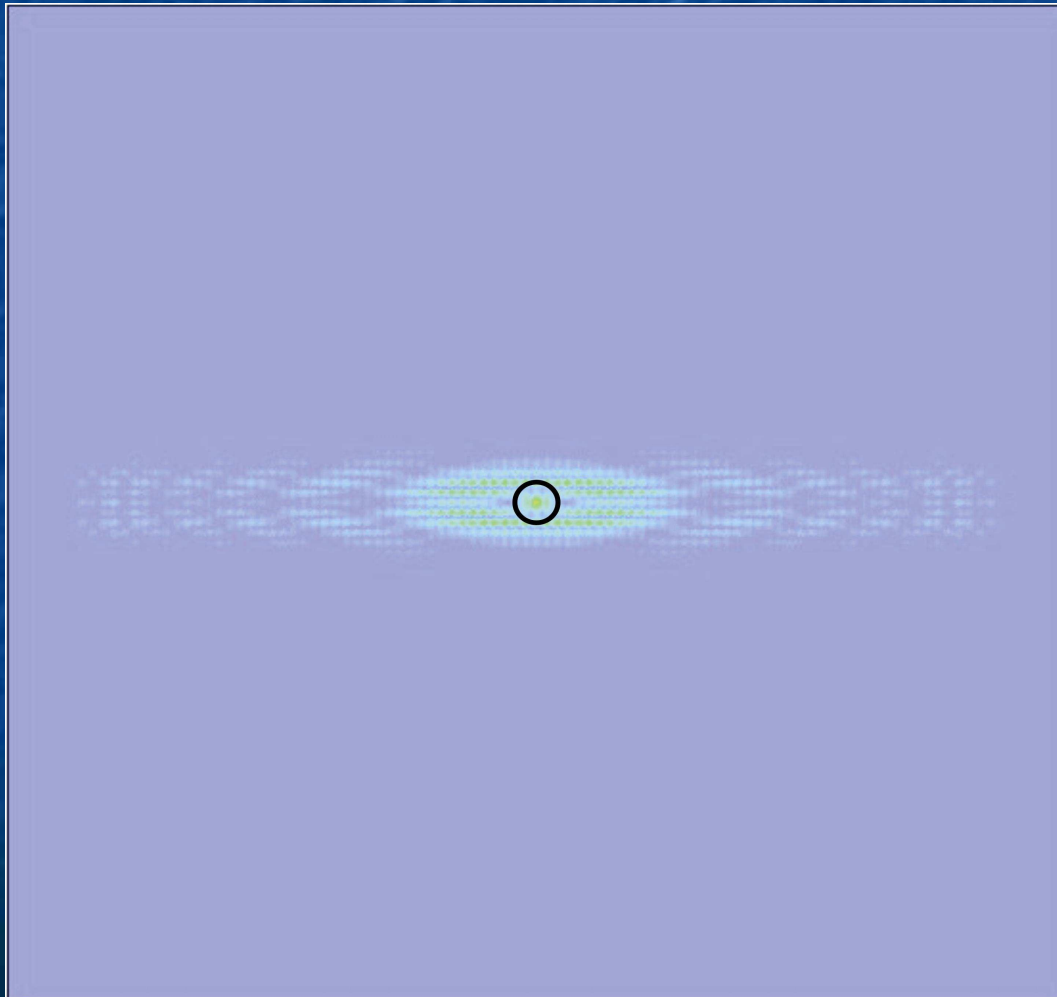
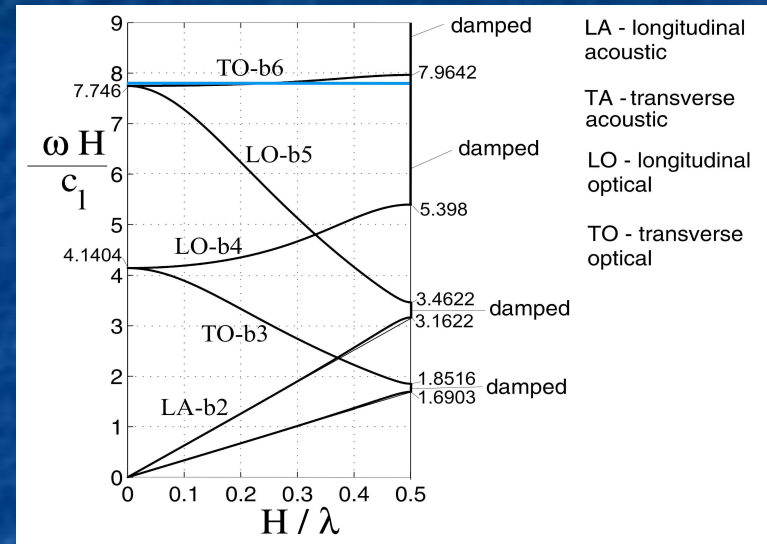


$$\omega H / c_1 = 7.7$$



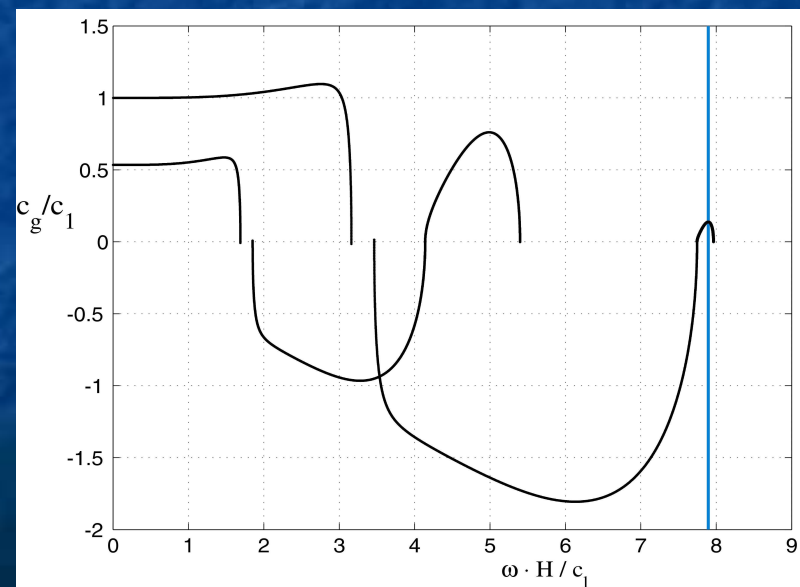
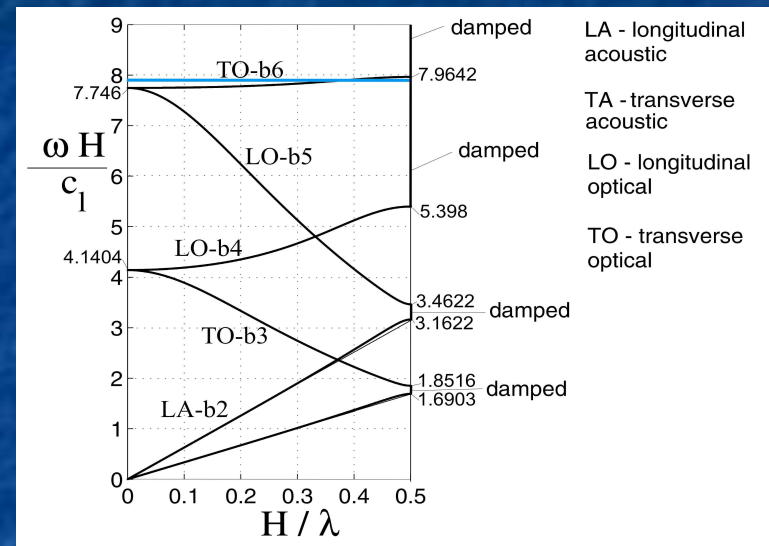
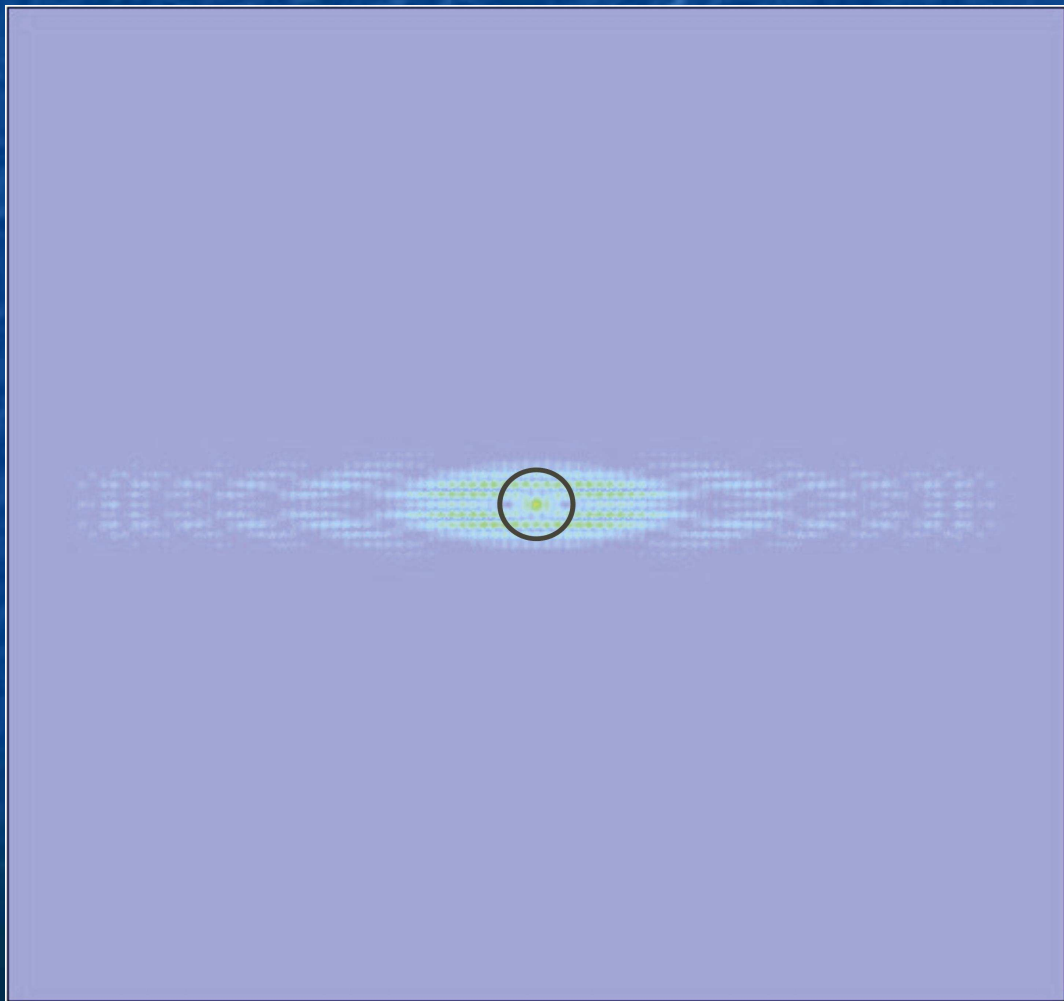


$$\omega H / c_1 = 7.8$$

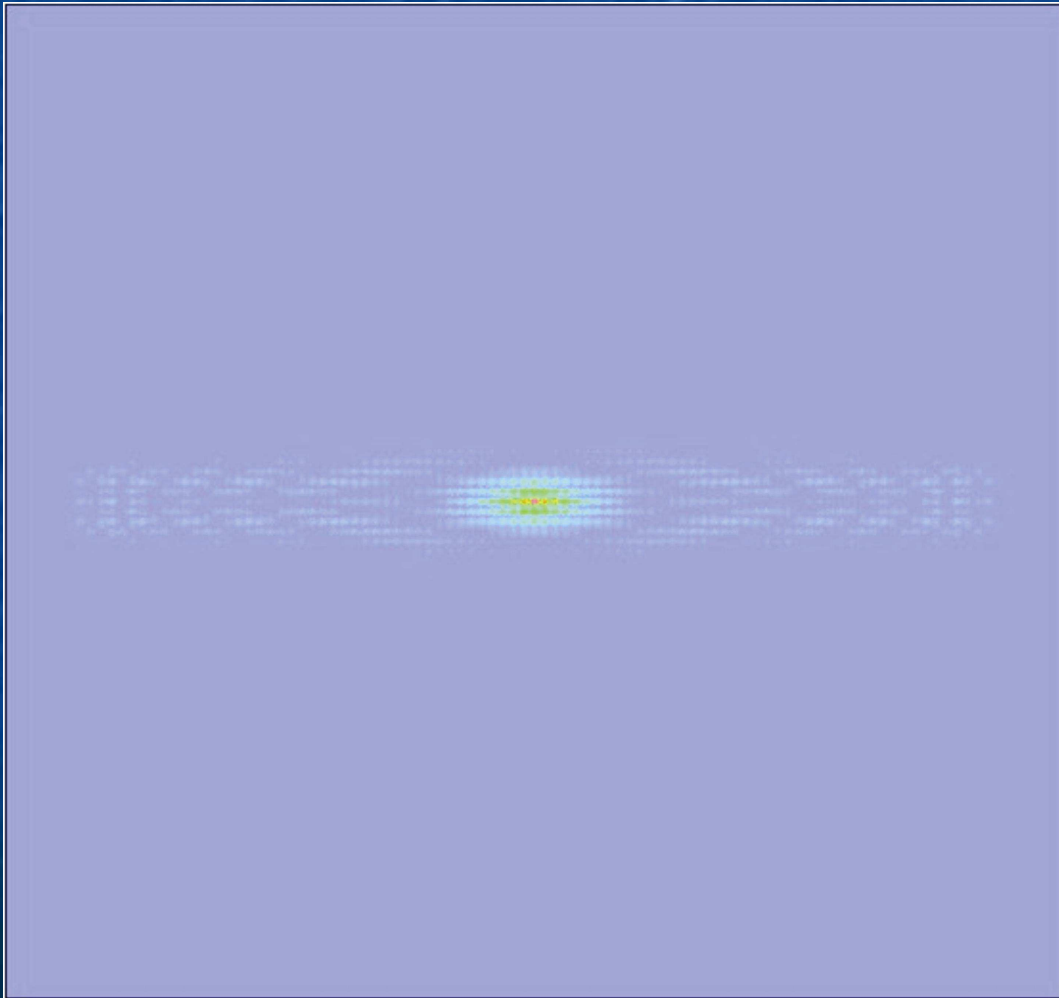
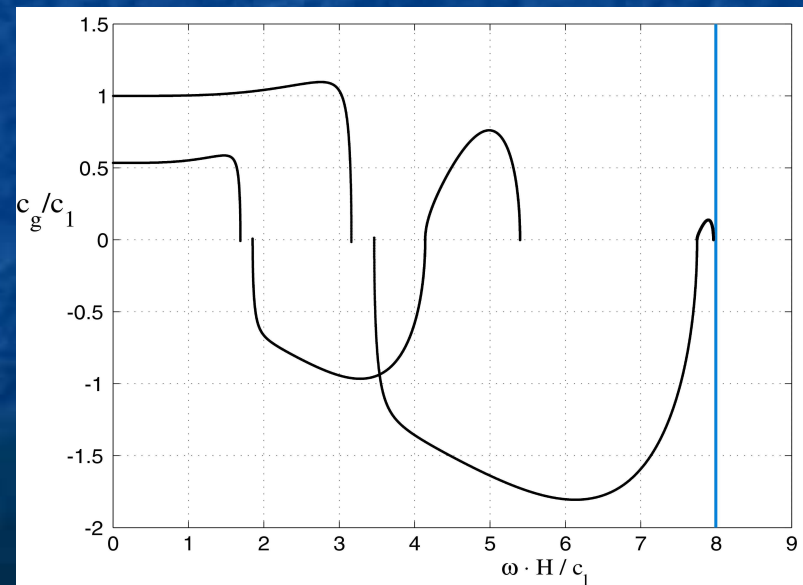
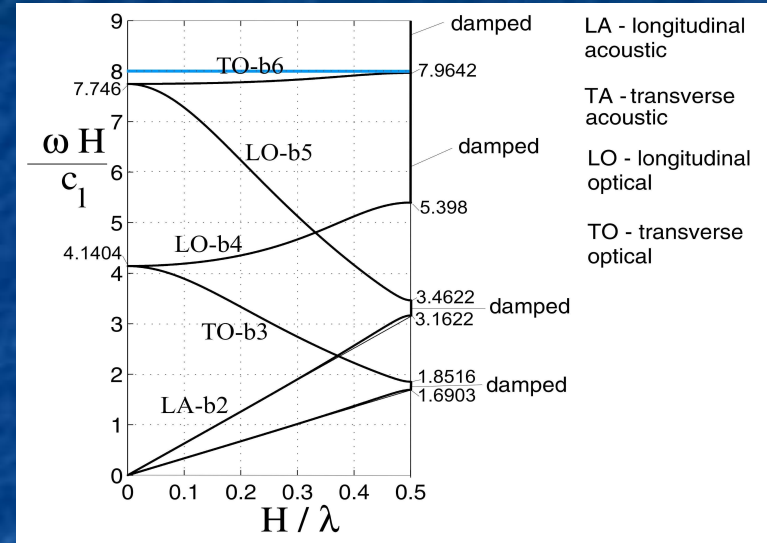




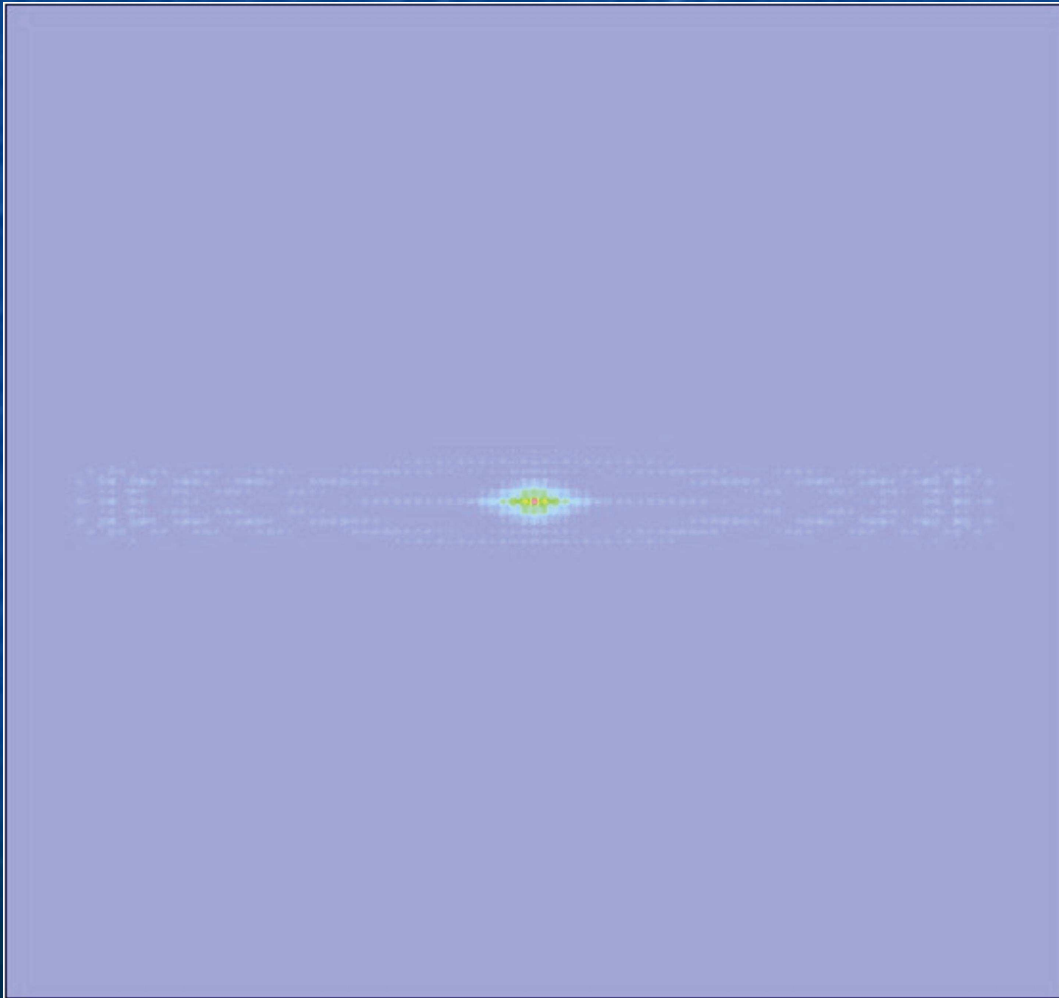
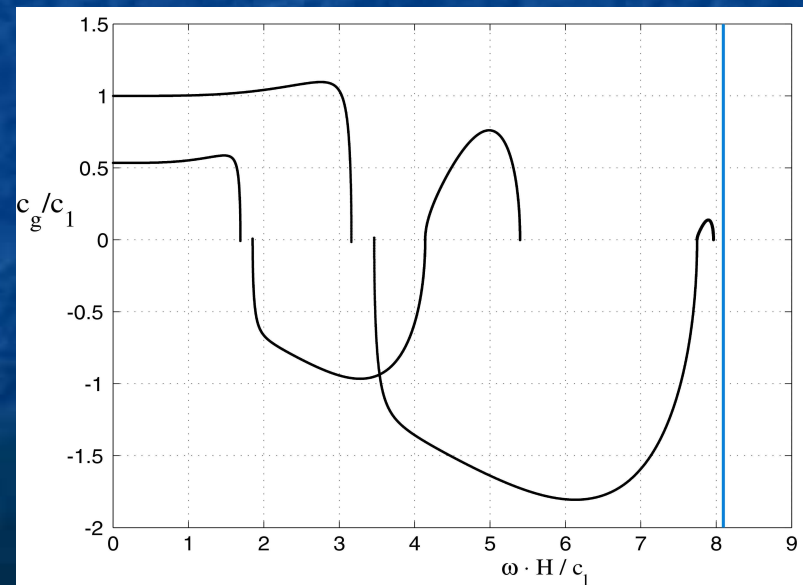
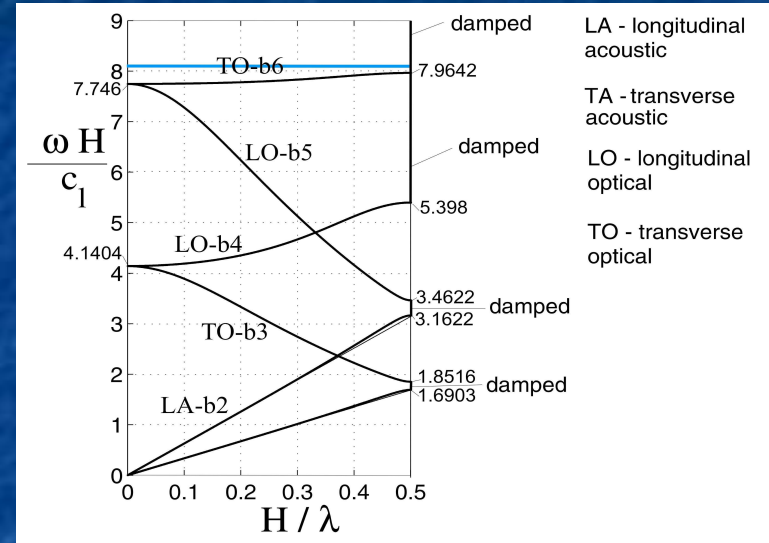
$$\omega H / c_1 = 7.9$$



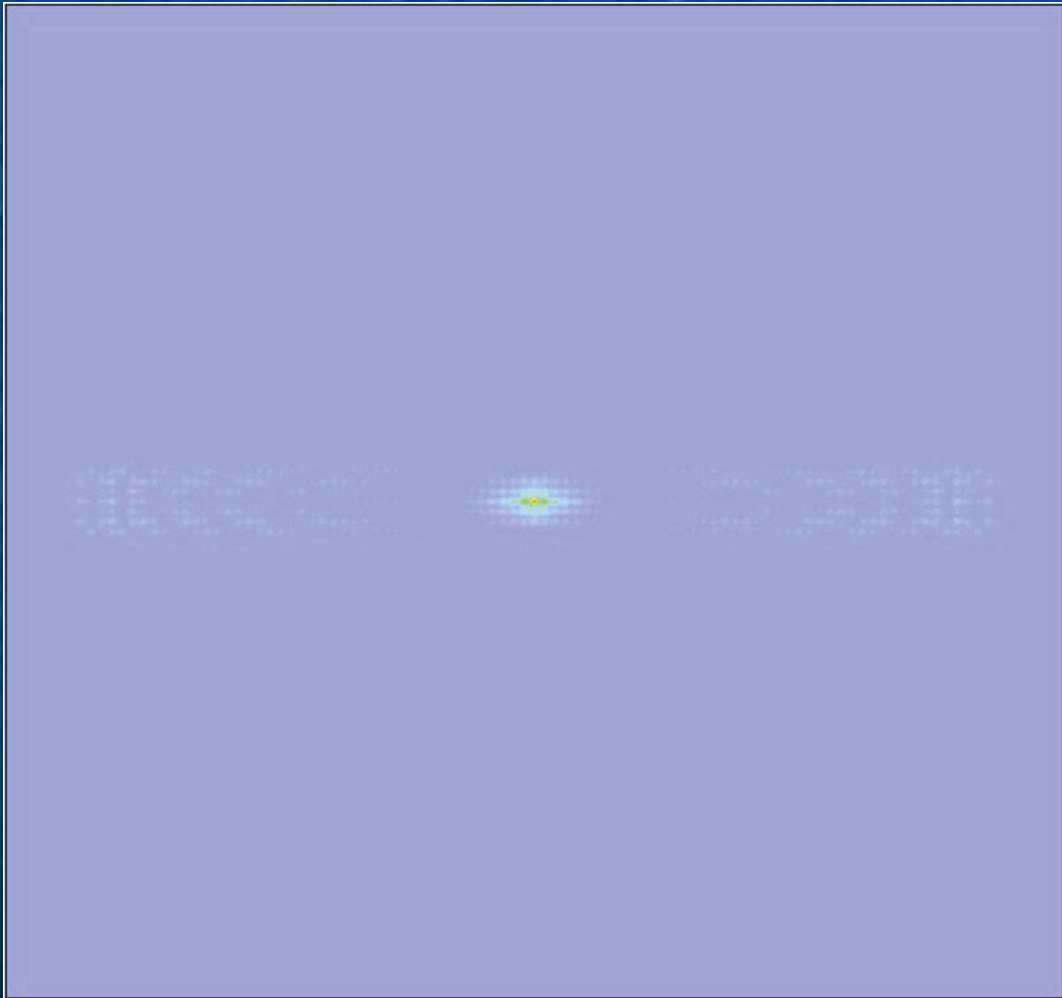
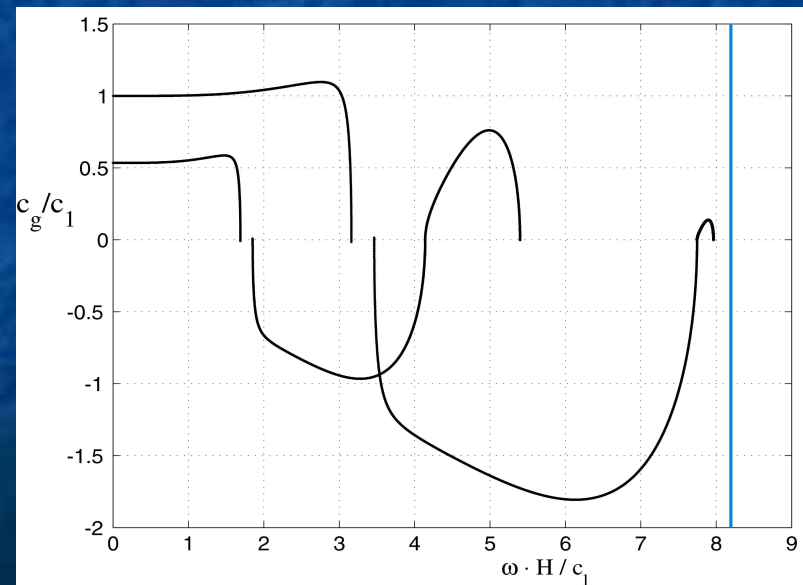
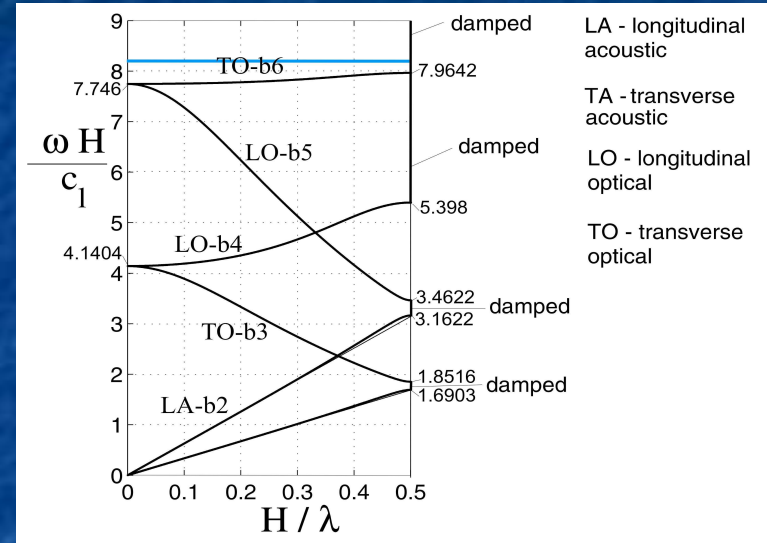
$$\omega H / c_1 = 8.0$$



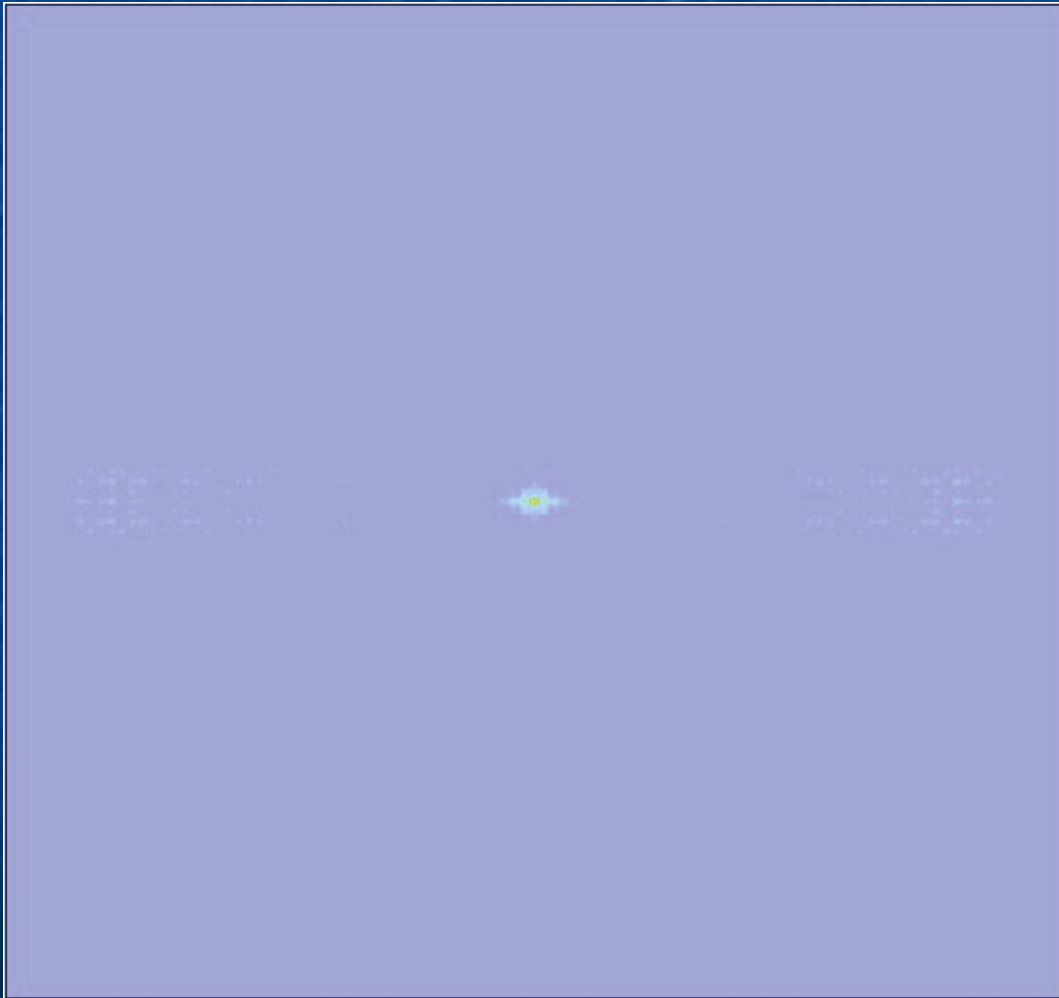
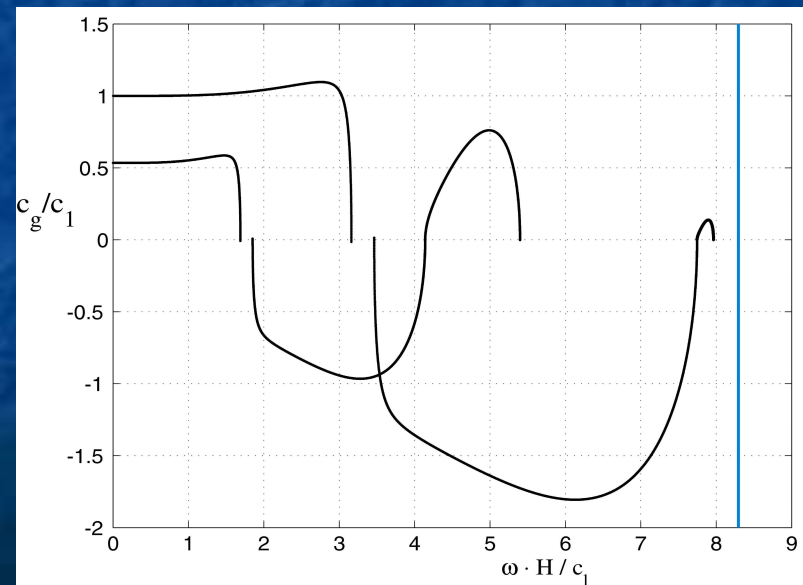
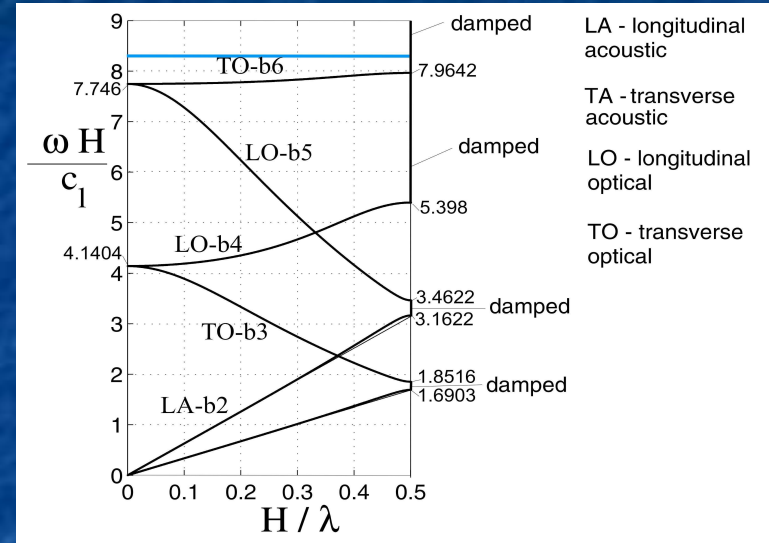
$$\omega H / c_1 = 8.1$$



$$\omega H / c_1 = 8.2$$



$$\omega H / c_1 = 8.3$$



Závěr

Na základě numerických testů odezvy rozlehlé stěny na proměnnou frekvenci buzení se podařilo ověřit platnost teoretických dispersních závislostí pro rovinné čtvercové kvadratické konečné prvky.

Děkuji za pozornost.

Tato práce byla podporována GA ČR 101/06/0914.