While publishing the resuts of your simulations based on this code please reference M. Kostylev, *J. Appl. Phys.* **113**, 053907 (2013).

Damon-Eshbach spin wave dispersion in an exchange-coupled bi-layer ferromagnetic film

Enter the number of mesh points n across the total thickness of the film. The number of caclulated modes will be 2n. n modes with the positive frequencies are the waves propagating in the positive direction of the axis. n modes with the negative frequencies are the waves propagating in the negative direction. The positive frequencies may not be equal to the positive one becasue of the borcken symmetry of the system which may lead to wave frequency nonreciprocity.
If you need to simulate a single layer film you may set identical magnetic parameters for both layers and L1=L2=0.5L, where L is the thickness of the single-layer film you want to simulate. You will also need to set the value of the inter-layer exchange constant A12 to A12=n*A1/(L1+L2) .

$n := 120$

Enter the layer thicknesses in cm (**no non-magnetic spacer between the layers**). Please send me a request if you need a non-magentic spacer. I will add it to the code.

$L1 := 30 \cdot 10^{-7}$ $L2 := 40 \cdot 10^{-7}$

Enter M=4πM_s in G, applied field H in Oe and γ in MHz/Oe:

$H := 500$ $\gamma := 2.82 \cdot 10^{6}$

$M1 := 10700$ $M2 := 4000$

Exchange constants in erg/cm^2

$A1 := 1.2\times 10^{-6}$ $A2 := .5\times 10^{-6}$

Interlayer exchange constant (exchange uncoupled layers: A12=0)

$A12 := 1 \cdot 10^{-6}$

Tue Mar 25 14:47:26 2014

pinned surface spins: zs=1, upinned ones: zs=0 only the **in-plane** component can be pinned. Magnetization is pinned at BOTH film surfaces **simultaneously**. Please contact Mikhail Kostylev if you need different pinning strengths for different film surfaces.

$zs := 0$

Tue Mar 25 15:03:50 2014

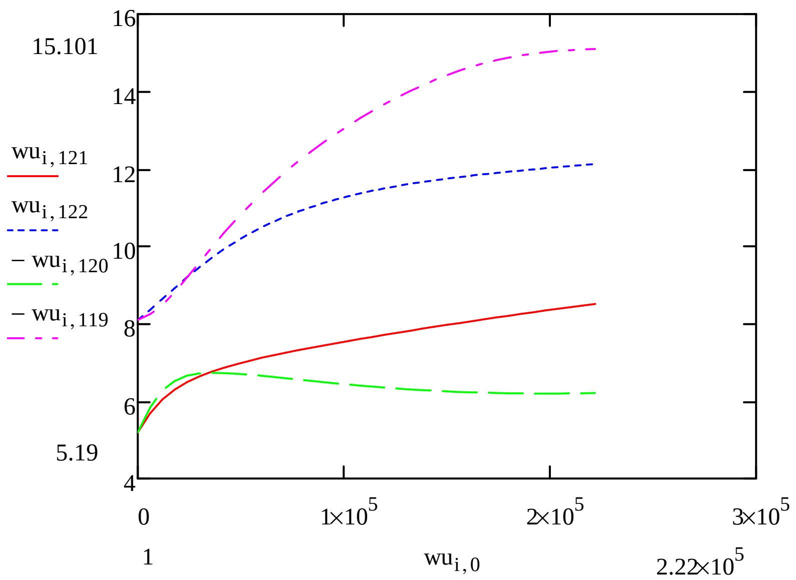
First column: DE wave wave number in cm-1, other columns spin wave mode frequencies in GHz.

	0	1	2	3	4
0	1	$-1.112\cdot 10^{4}$	$-1.042\cdot 10^{4}$	$-1.041\cdot 10^{4}$	$-1.039\cdot 10^{4}$

wu =

1	$6.001\cdot10^3$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
2	$1.2\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
3	$1.8\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
4	$2.4\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
5	$3\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
6	$3.6\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
7	$4.2\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
8	$4.8\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
9	$5.4\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
10	$6\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
11	$6.6\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
12	$7.2\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
13	$7.8\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
14	$8.4\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	$-1.039\cdot10^4$
15	$9\cdot10^4$	$-1.112\cdot10^4$	$-1.042\cdot10^4$	$-1.041\cdot10^4$	...

$i := 0, 1 .. \text{rows}(wu) - 1$



WRITEPRN("spectrum.prn") := out

$$U_{i,\, j+nmax} := \sum_{liter=0}^{n-1} \left(C2_{liter,\, ws2_{j,1}} \cdot \overline{C1_{liter,\, ws1_{i,1}}} \right)$$

$$U_{i+nmax,\, j} := \sum_{liter=0}^{n-1} \left(C1_{liter,\, ws1_{j,1}} \cdot \overline{C2_{liter,\, ws2_{i,1}}} \right)$$

U12 = ▮