Transmission of Electrical Signals by Spin-Wave Interconversion in A Magnetic Insulator

Jing Li

Ferro Thin Film Lab

05/29/2020

Non-equilibrium spin currents

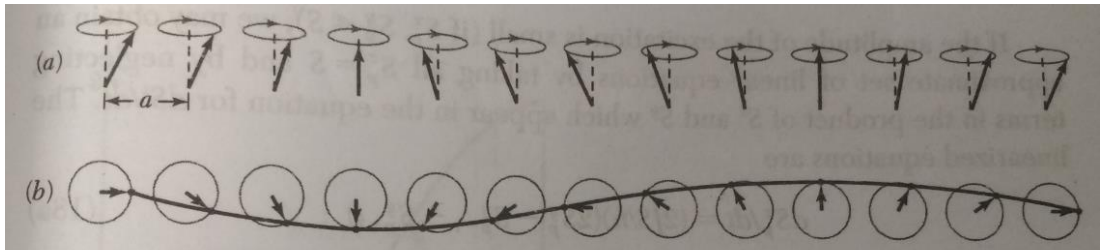
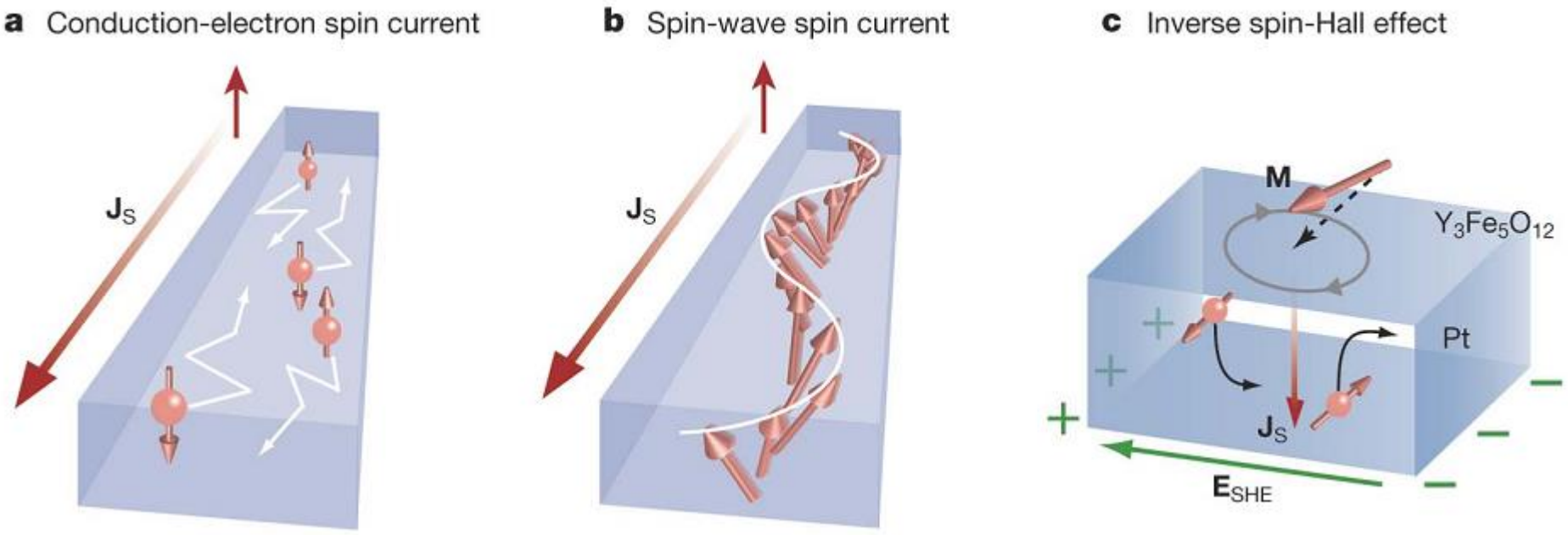
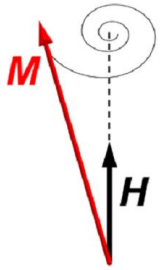


Figure 9 A spin wave on a line of spins. (a) The spins viewed in perspective. (b) Spins viewed from above, showing one wavelength. The wave is drawn through the ends of the spin vectors.

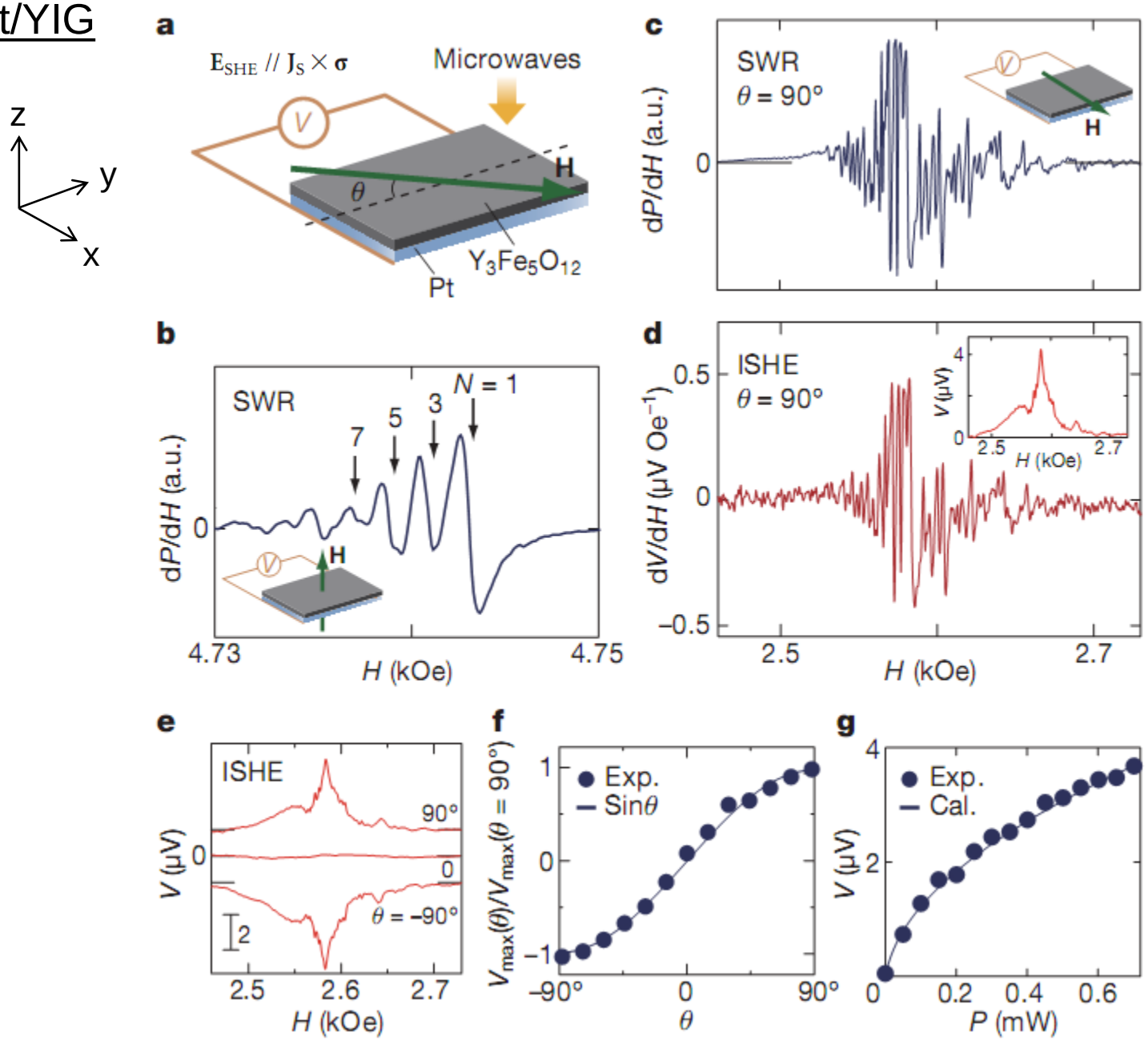




$$\frac{d\boldsymbol{M}(t)}{dt} = -\gamma \boldsymbol{M} \times \boldsymbol{H}_{\mathrm{eff}} + \frac{\alpha}{M_S} \boldsymbol{M} \times \frac{d\boldsymbol{M}}{dt}$$

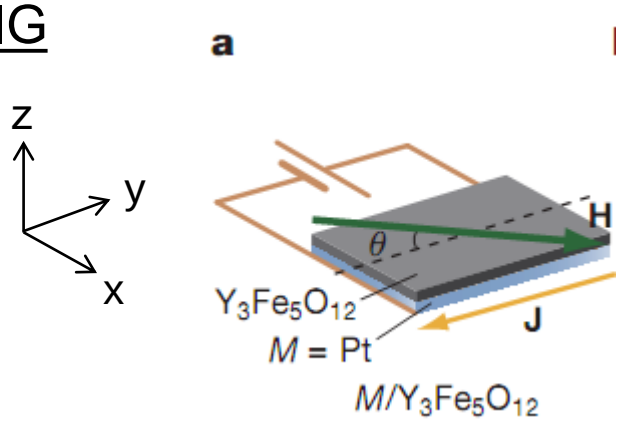
Y. Kajiwara, et al, Nature 464, 262-267 (2010)
C. Kittel, *Introduction to Solid State Physics*

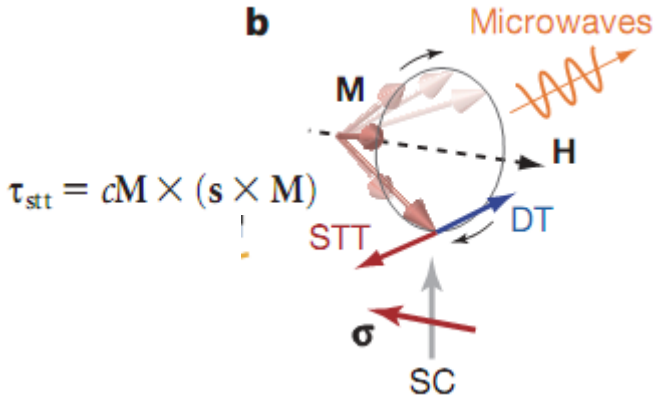
Spin pumping in Pt/YIG



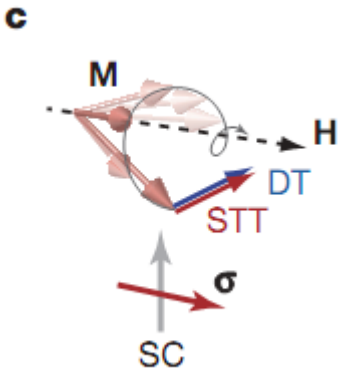
Y. Kajiwara, et al, Nature 464, 262-267 (2010)

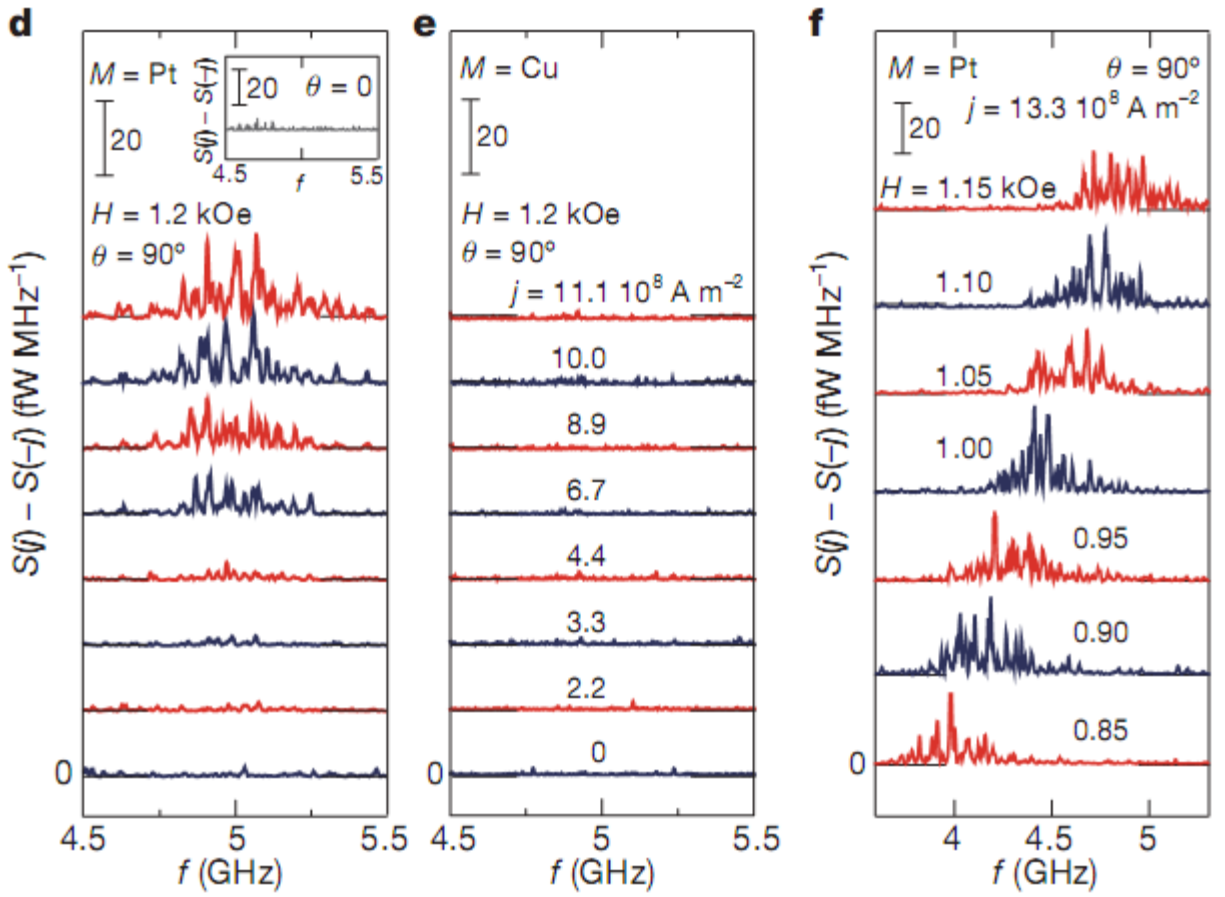
STT in Pt/YIG

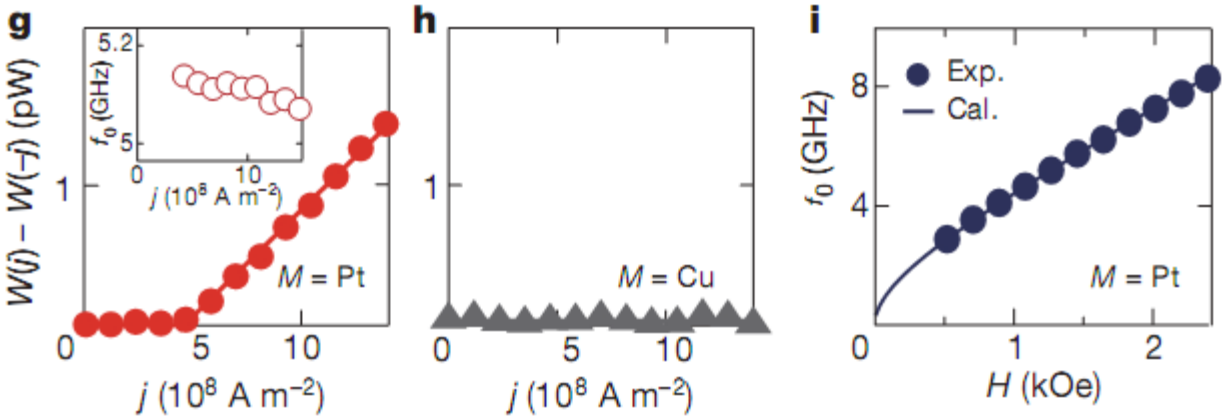




$$\tau_{stt} = cM \times (s \times M)$$

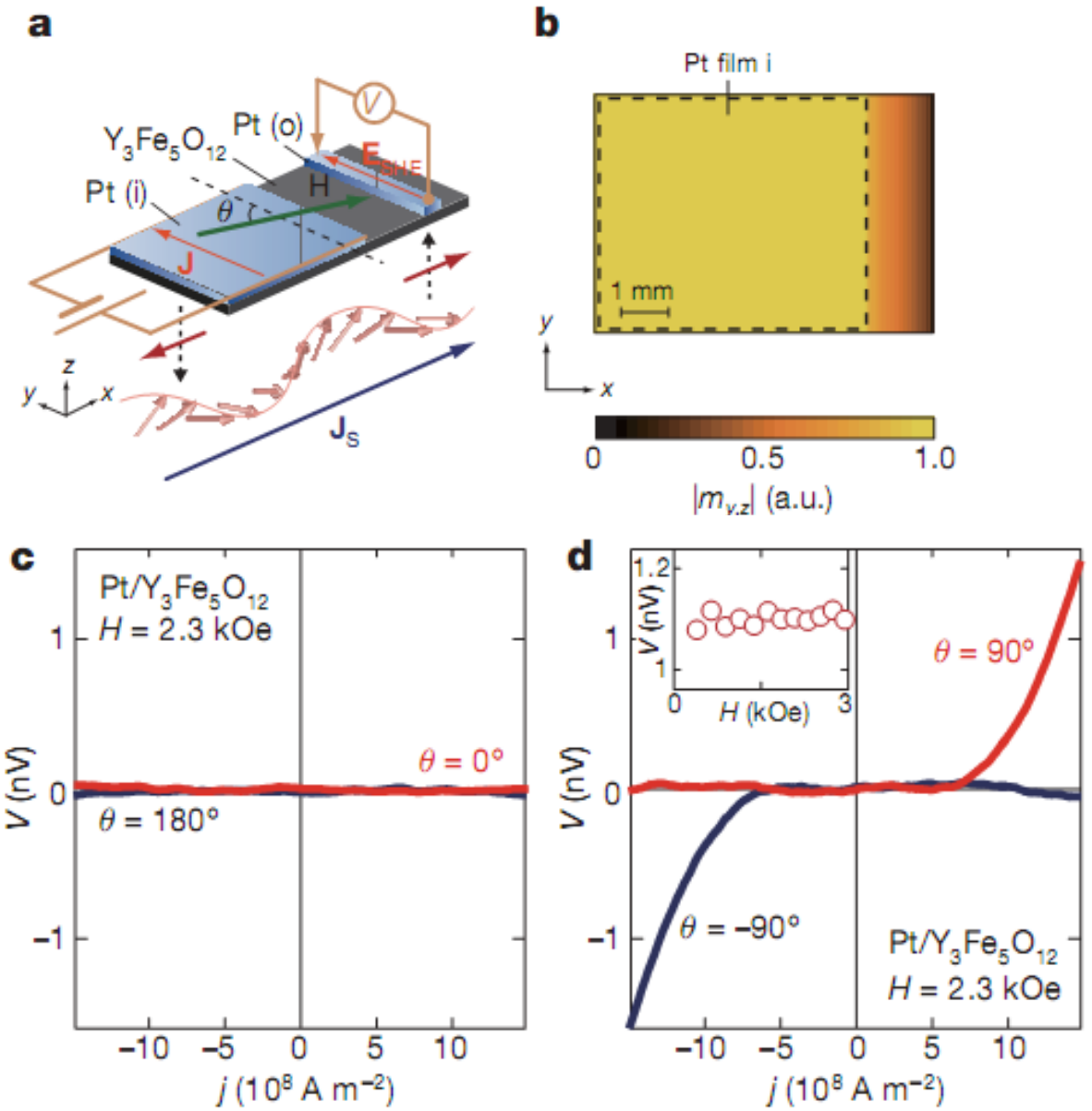






Y. Kajiwara, et al, Nature 464, 262-267 (2010)

Electrical signal transmission



Y. Kajiwara, et al, Nature 464, 262-267 (2010)