

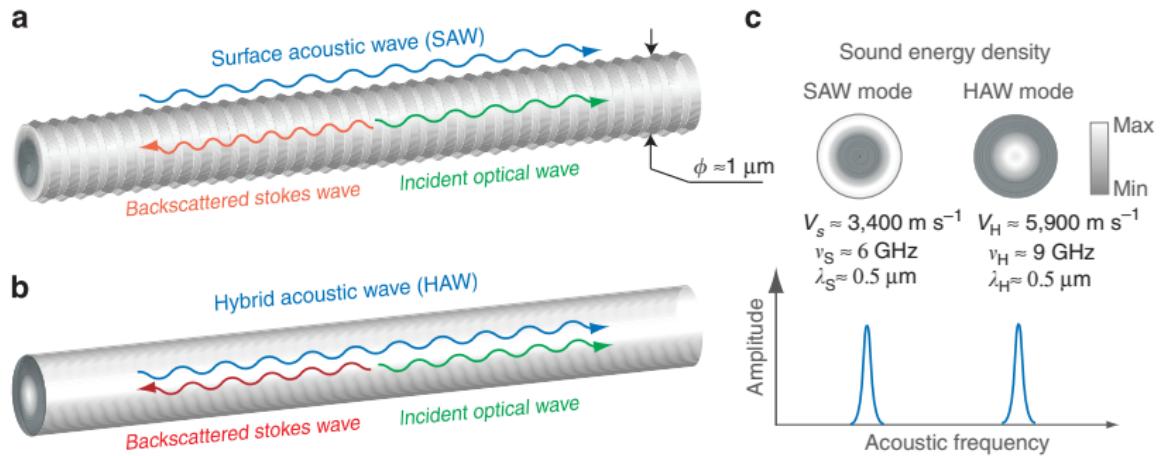
Brillouin light scattering from surface acoustic waves in a subwavelength-diameter optical fibre

[Beugnot, J.-C. *et al.* Nat. Commun **5**, (2014)]

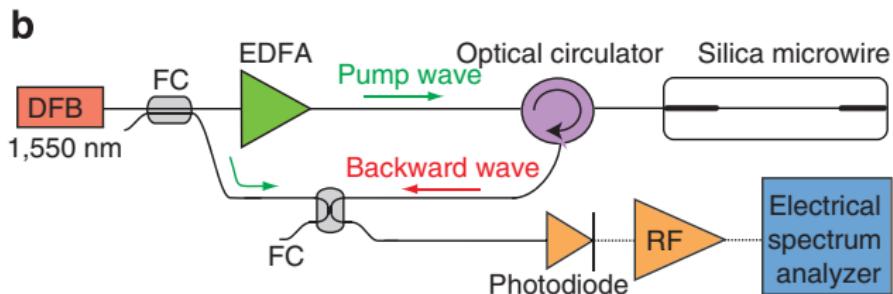
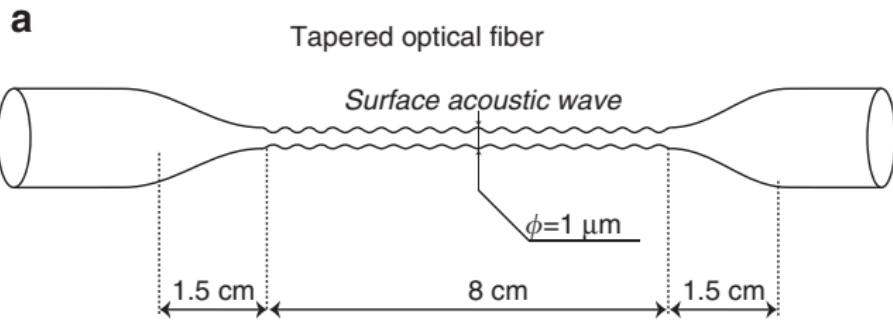
Qin Yingchun

December 15, 2016

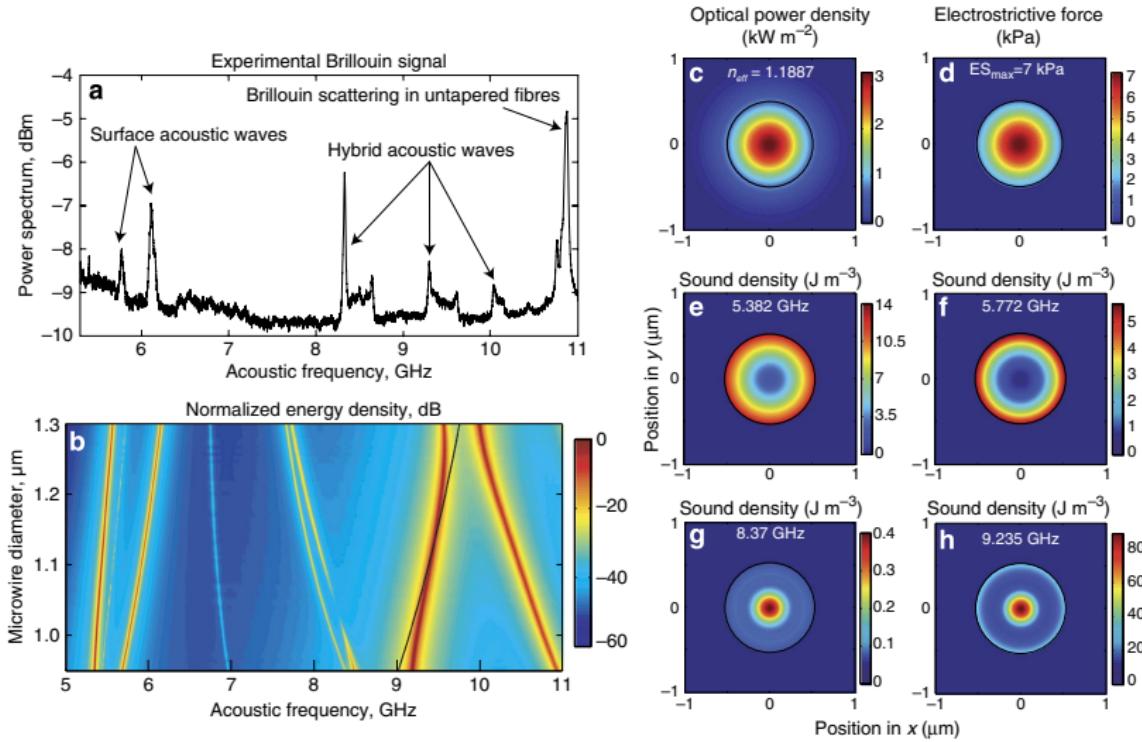
Surface and hybrid acoustic wave Brillouin scattering in silica microwire



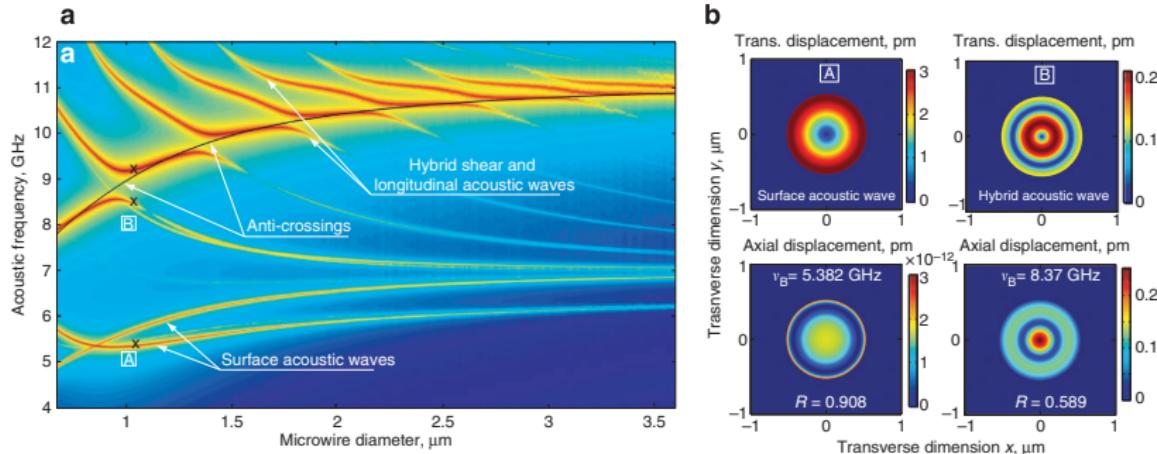
Experimental implementation



Results and simulation



Numerical simulations of the full acoustic wave spectrum



Brillouin gain and threshold for the stimulated regime

Brillouin gain:

$$g_B = \frac{4\pi n_{\text{eff}}^8 P_{12}^2}{c\rho\lambda^3\nu_B\Delta\nu_B}$$

for SAW in subwavelegth fiber:

$$g_B = 1.4 \times 10^{-12} \text{ mW}^{-1}$$

$$\frac{g_B}{A_{\text{eff}}} = 8 \text{ W}^{-1}\text{m}^{-1}$$

for HAW in fiber:

$$g_B = 3 \times 10^{-11} \text{ mW}^{-1}$$

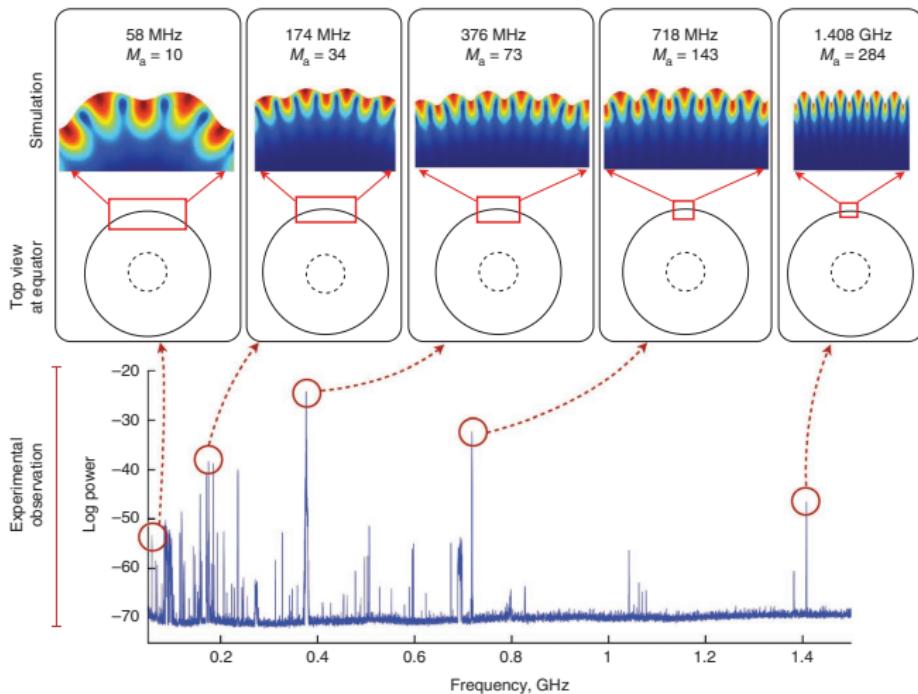
$$\frac{g_B}{A_{\text{eff}}} = 0.4 \text{ W}^{-1}\text{m}^{-1}$$

Threshold:

$$P_{\text{th}} = \frac{21A_{\text{eff}}}{Kg_B L_{\text{eff}}}$$

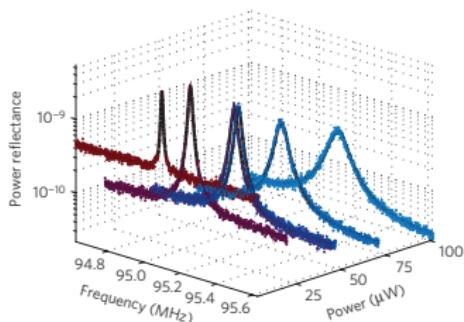
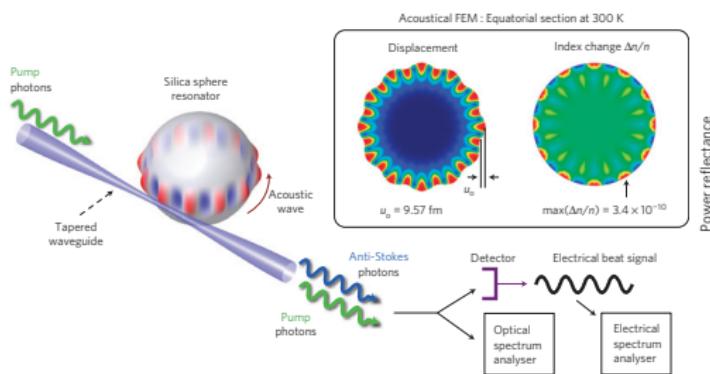
More on Brillouin scattering

Stimulated optomechanical excitation of SAW



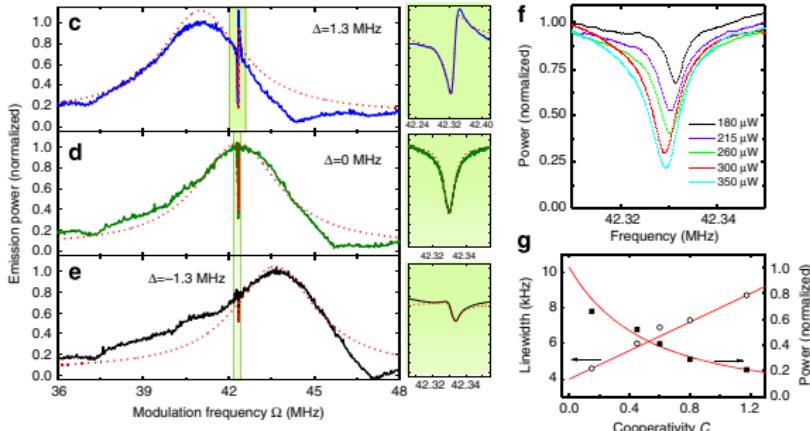
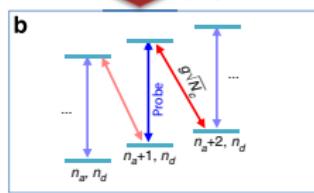
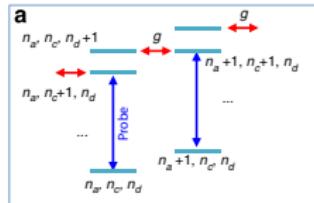
More on Brillouin scattering

Observation of spontaneous Brillouin cooling



More on Brillouin scattering

Brillouin-scattering-induced transparency



More on Brillouin scattering

Non-reciprocal light storage

