

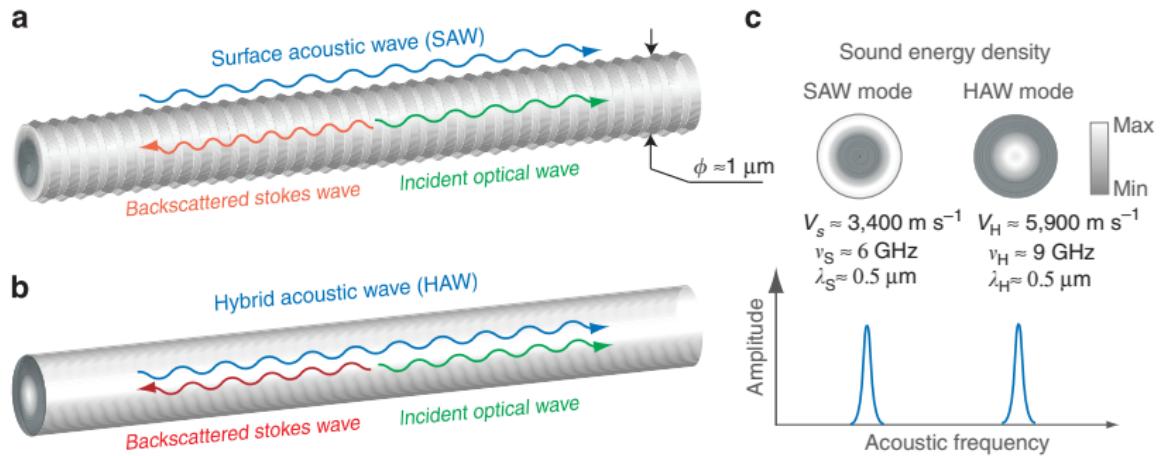
# Brillouin light scattering from surface acoustic waves in a subwavelength-diameter optical fibre

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

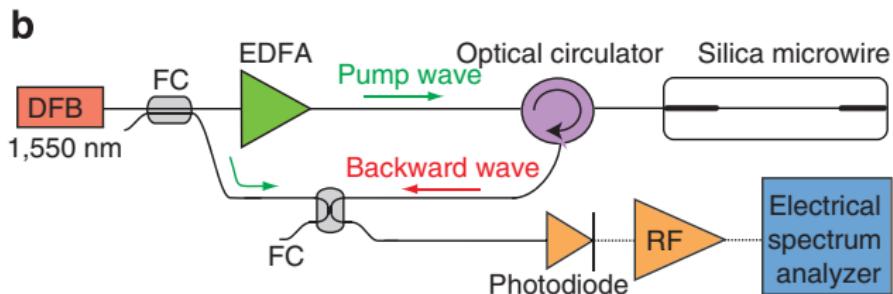
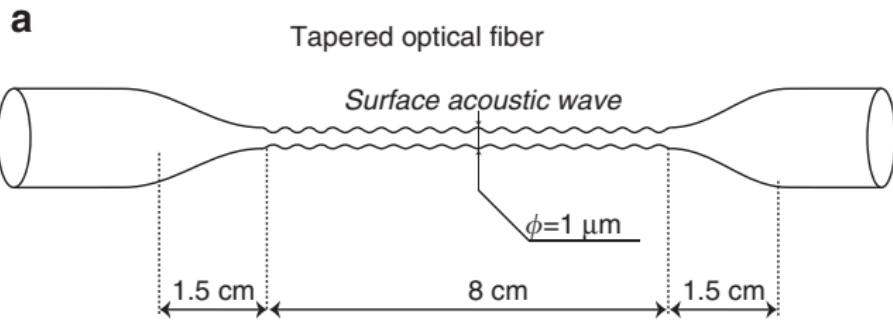
Qin Yingchun

December 17, 2016

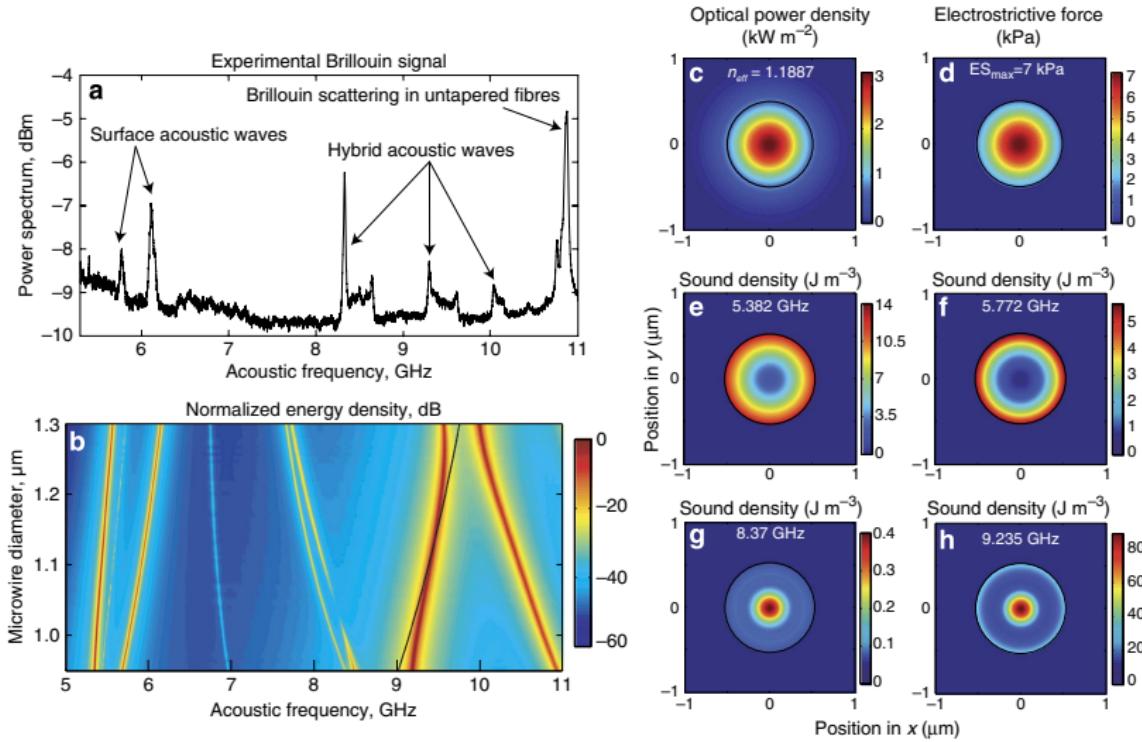
# Surface and hybrid acoustic wave Brillouin scattering in silica microwire



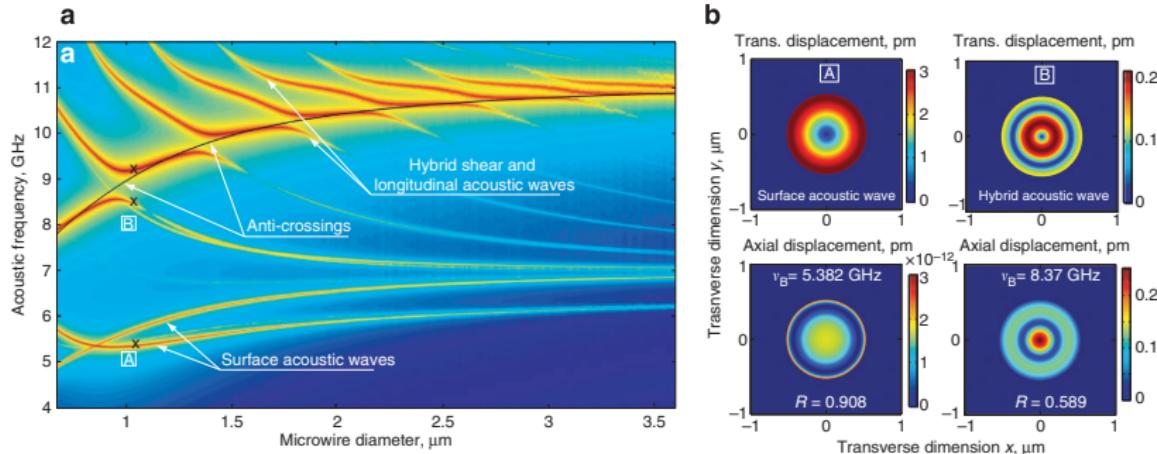
# Experimental implementation



# 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:

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

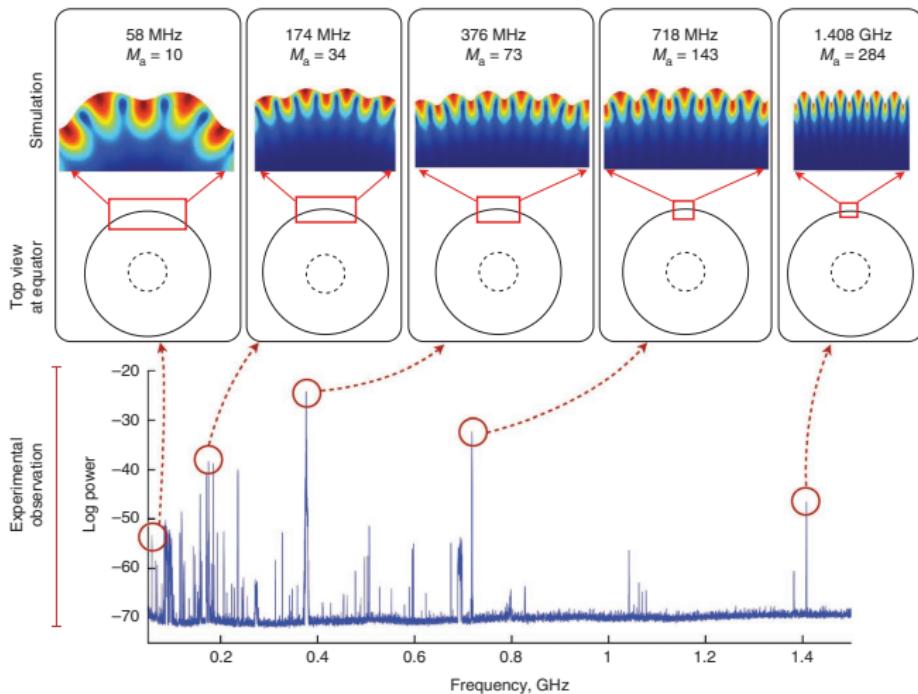
$$\frac{g_B}{A_{\text{eff}}} = 0.4 \text{ W}^{-1}\text{m}^{-1}$$

Threshold:

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

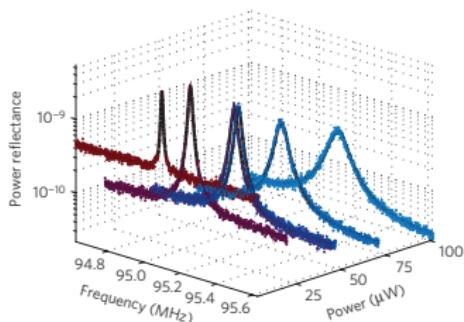
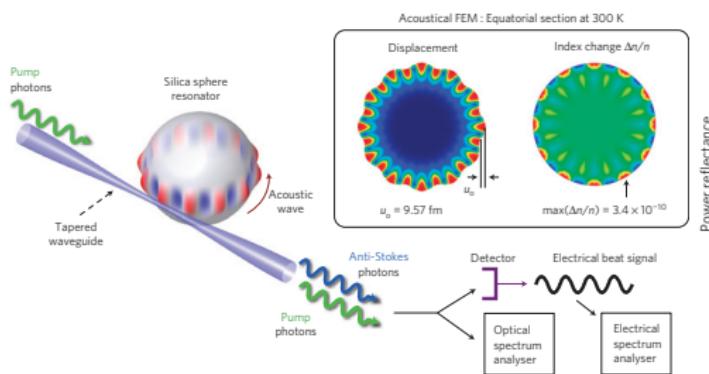
# More on Brillouin scattering

Stimulated optomechanical excitation of SAW



# More on Brillouin scattering

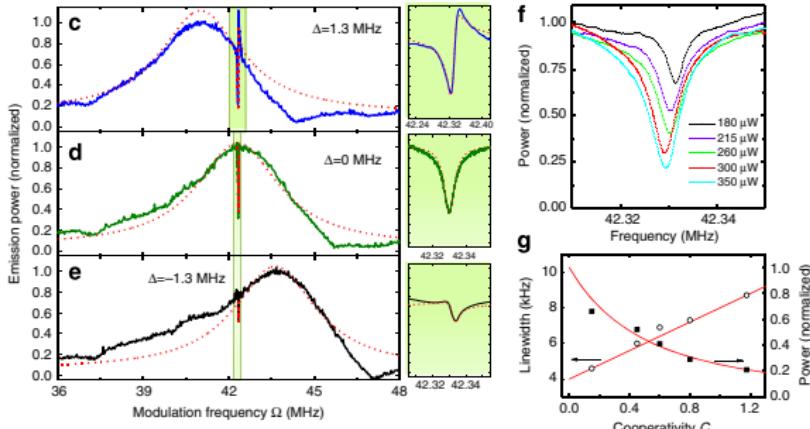
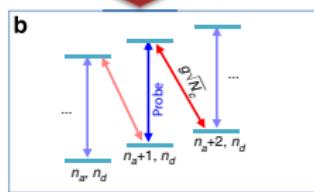
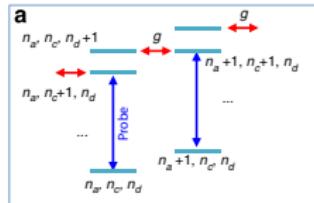
## Observation of spontaneous Brillouin cooling



Bahl, G. et al. Nat. Phys. 8, 203207 (2012).

# More on Brillouin scattering

## Brillouin-scattering-induced transparency



# More on Brillouin scattering

## Non-reciprocal light storage

