

Shadowgraphy at AWAKE

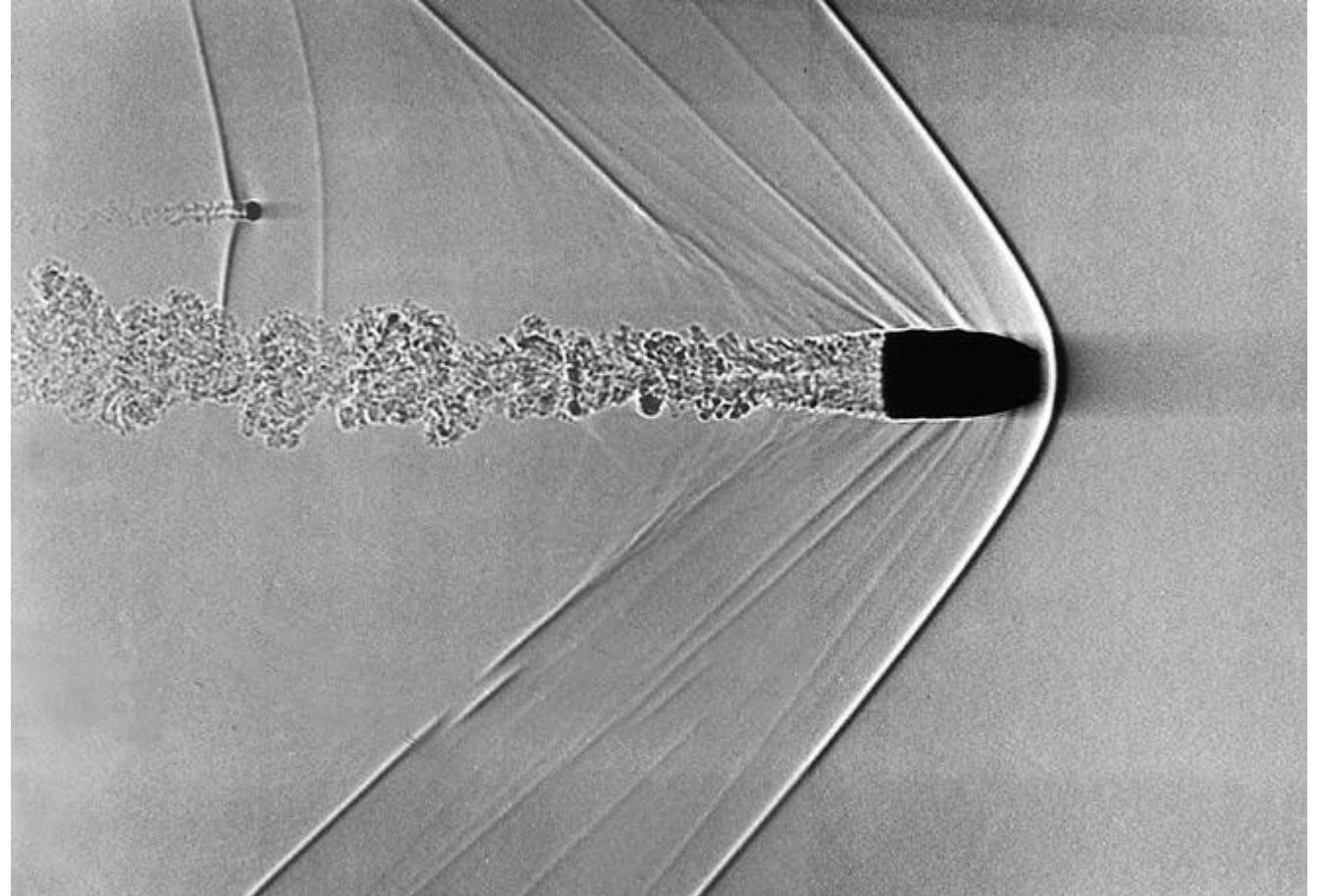
Jan Pucek

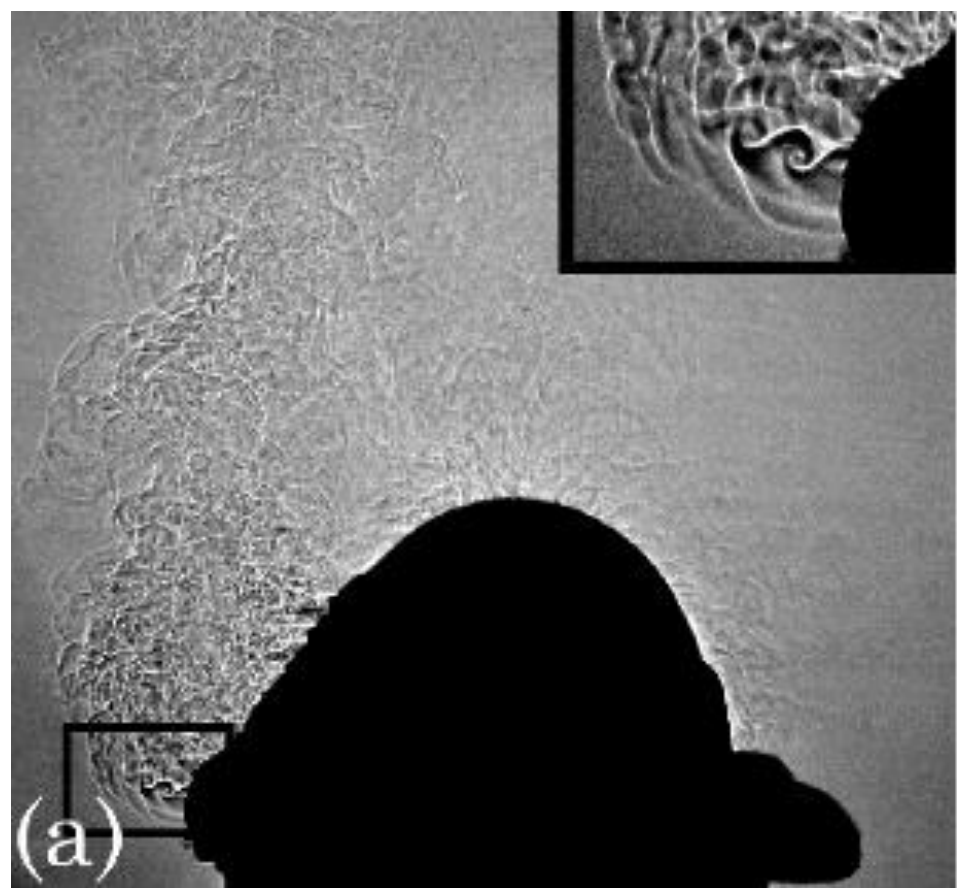
23/08/2019

MPP Friday meeting

What is shadowgraphy?

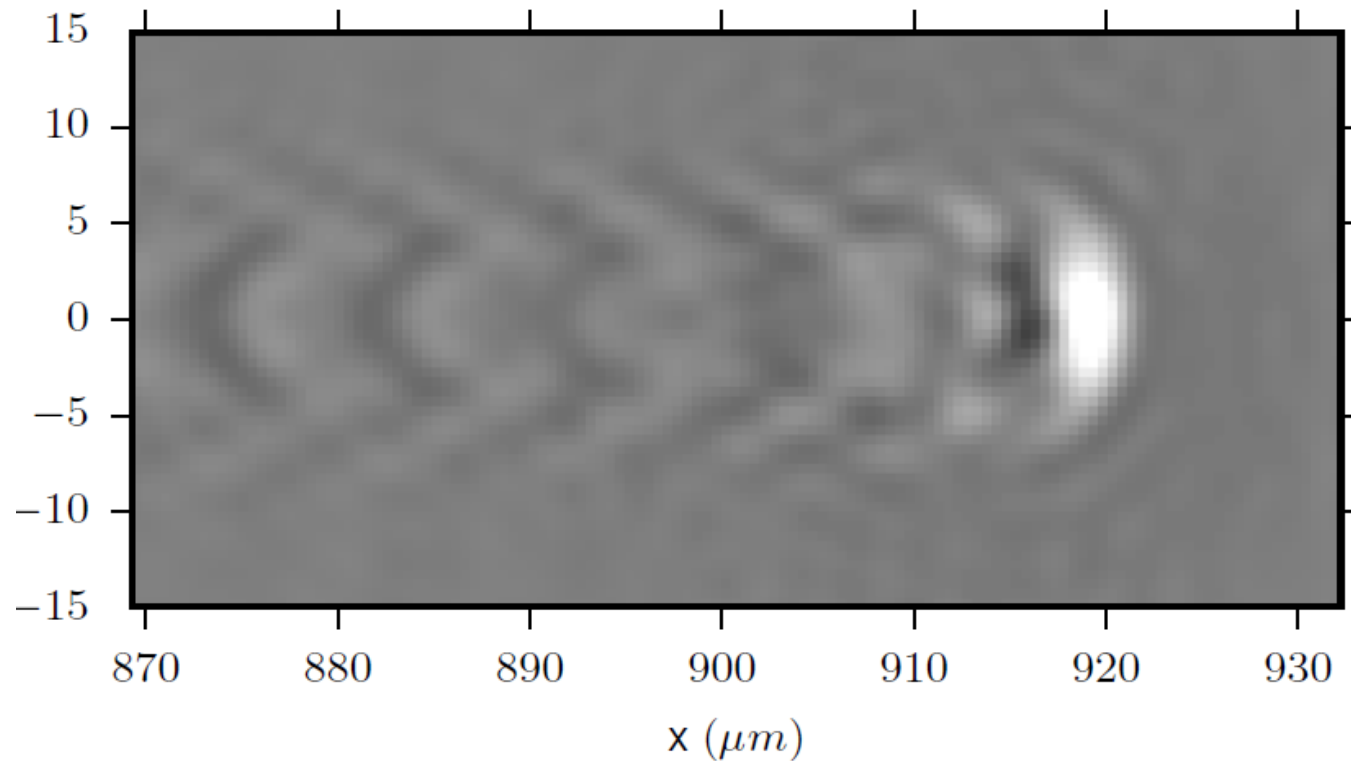
- Visualization of regions with different index of refraction (n)





Why do we want to use it?

- To obtain an image of plasma waves



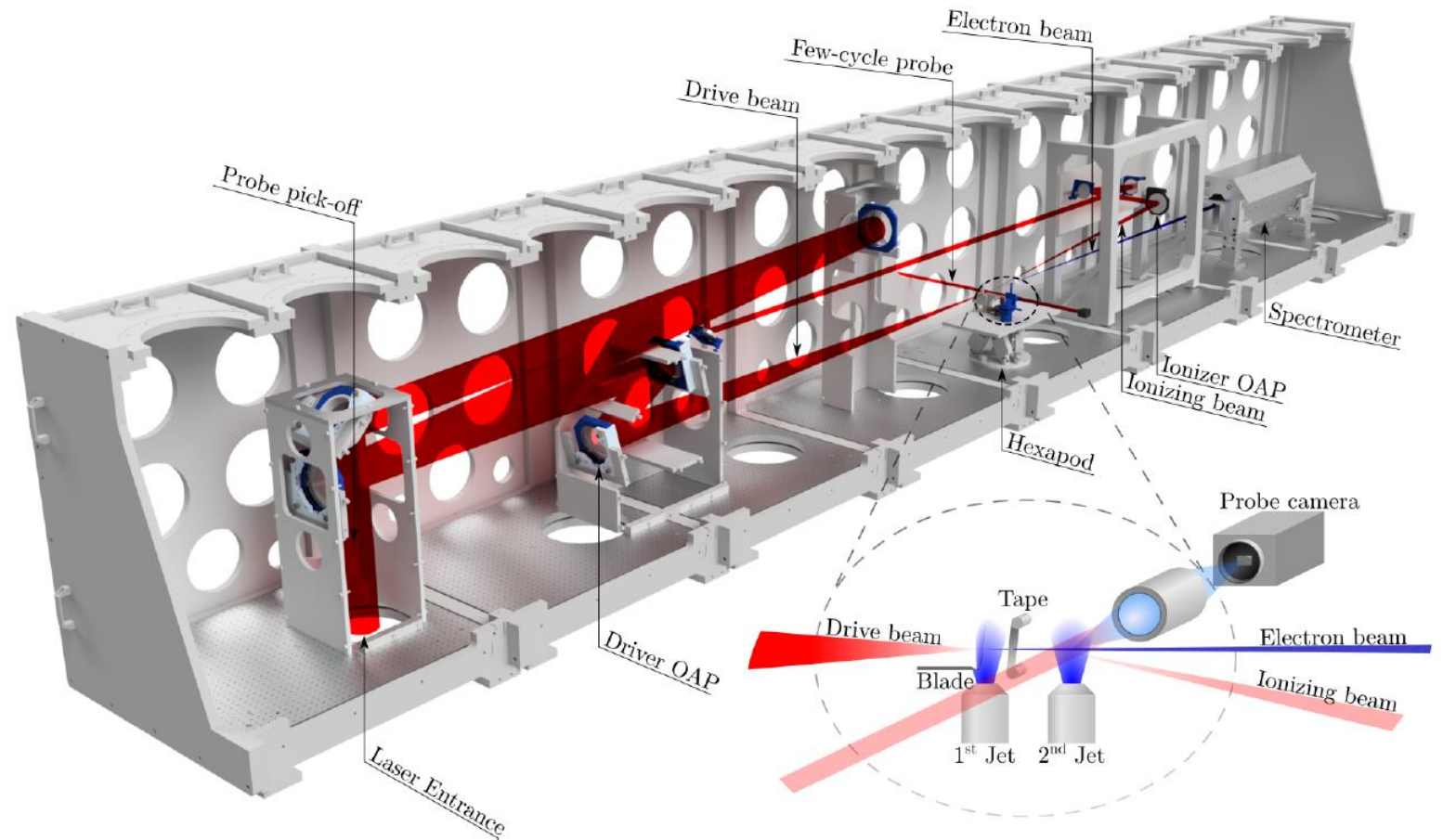
Laser wakefield measurement setup

For plasma: $n = \sqrt{1 - \frac{\omega_{pe}^2}{\omega^2}}$

where $\omega_{pe} = \sqrt{\frac{n_e e^2}{\epsilon_0 m_e}}$

for LWFA the density is $n_e \approx 10^{19} \text{ cm}^{-3}$

Thus the $\frac{\omega_{pe}^2}{\omega^2} = 7 \times 10^{-3}$



	LWFA		PWFA
Plasma wavelength (λ_p)	10 μm		1 mm
Probe wavelength	800 nm		800 nm \longrightarrow 300 μm
$\frac{\omega_{pe}^2}{\omega^2}$	7×10^{-3}		7×10^{-7} \longrightarrow 3×10^{-2}

This looks good, so what is the problem?

Key questions

- Usage of THz radiation is challenging
 - How to generate the probe?
 - What detection system (detector + optics) to use?
 - How to interpret the signal?
 - How will this constrain the design of the vapor source?

Proposed scheme

