

3rd EAAC Workshop Elba 2017

highlights/trends



Rep. rate:

- Laser for ELI: 1PW@10Hz
- LBNL plans towards 0.75PW laser at 10kHz
- 1MeV bunches demonstrated @ 1kHz

Energy:

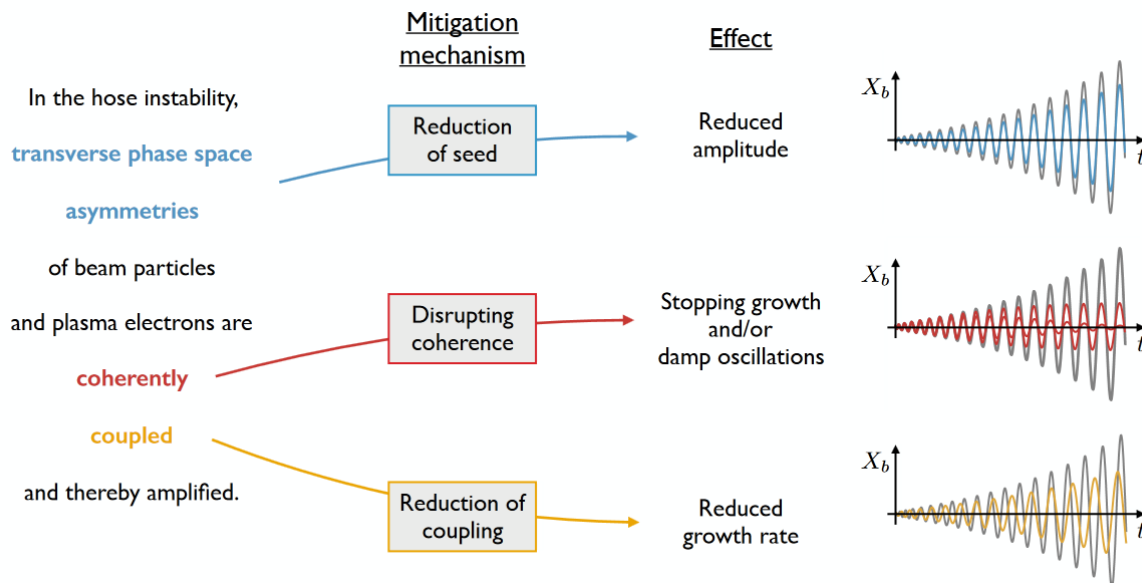
- > 6GeV reached in 200mm LWFA stage @ LBNL

Applications:

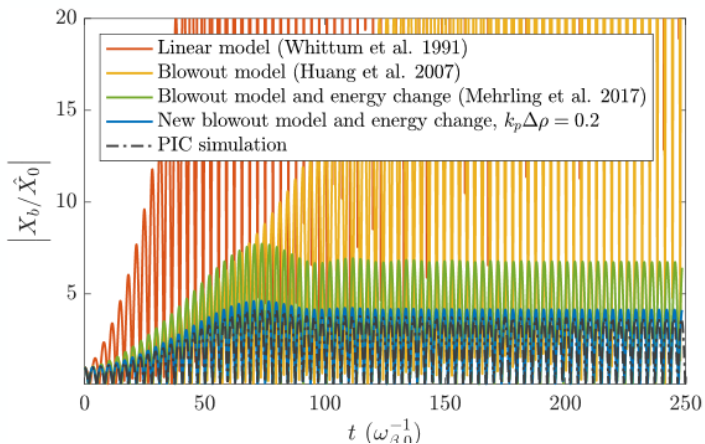
- LUX & COXINEL projects on LWFA driven FEL produced first undulator radiation
- KIT transported first beams to undulator

Mitigation of hosing instability: disruption of coherence

- e.g. increased energy spread/energy chirp
- Even reduction of initial seed (transverse PS asymmetries) observed



Predictions of different hosing models at tail of beam (without initial energy spread)



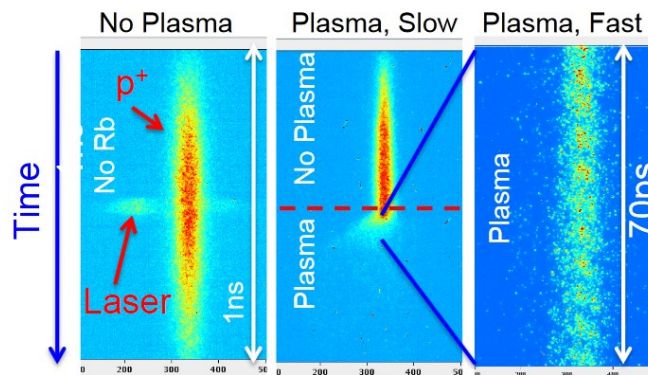
PWFA

AWAKE started first campaign

- Observed reproducible seeded and unseeded self modulation instability
- Working towards electron injection

OTR

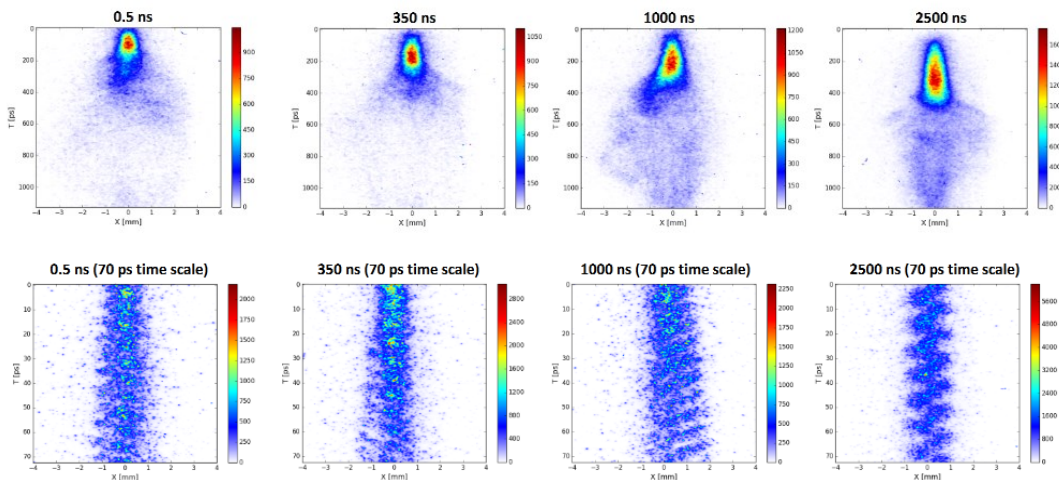
Streak camera Images



$n_{Rb} = 3.7 \times 10^{14} \text{cm}^{-3}$
 $N = 3 \times 10^{11} p^+$
 Long
 $f_{\text{mod}} \sim 164 \text{GHz}$

Preliminary!!!

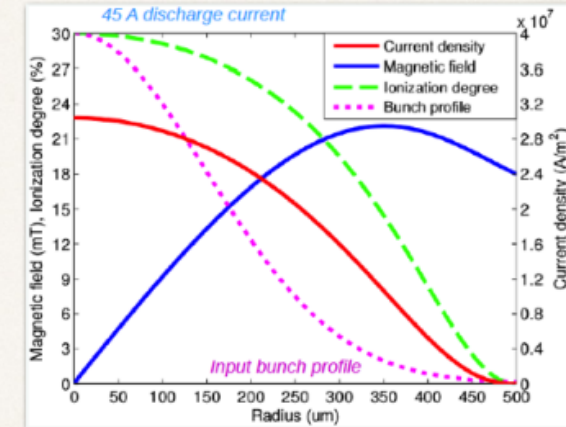
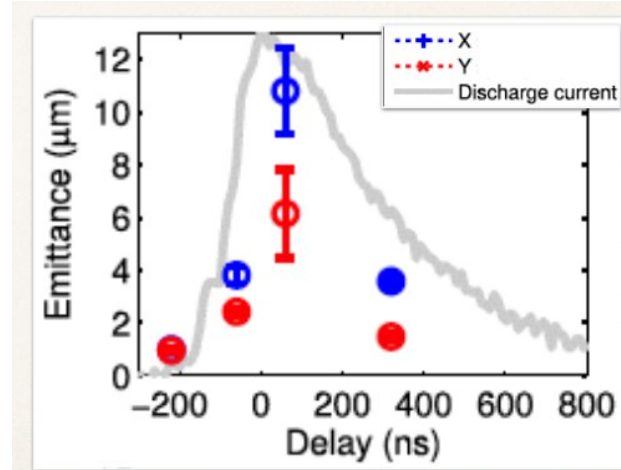
K. Rieger, MPP



plasma lenses

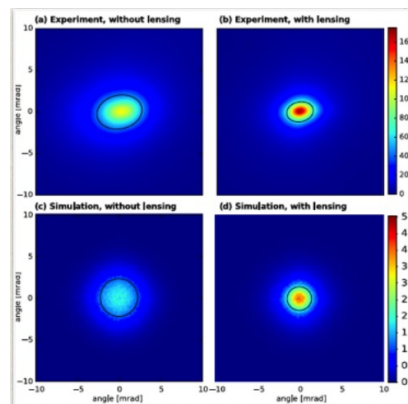
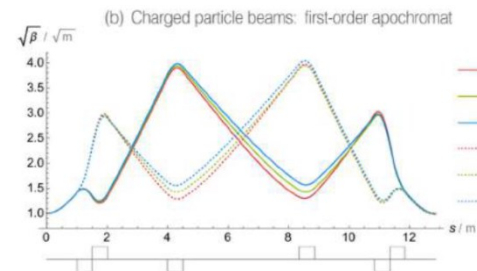
Active lenses

- Observed emittance degradation at every active plasma lens experiment
- Observed wakefield influence for short bunches
- Beamline with reduced chromaticity proposed at Oslo/CLEAR
- MHD modelling ongoing

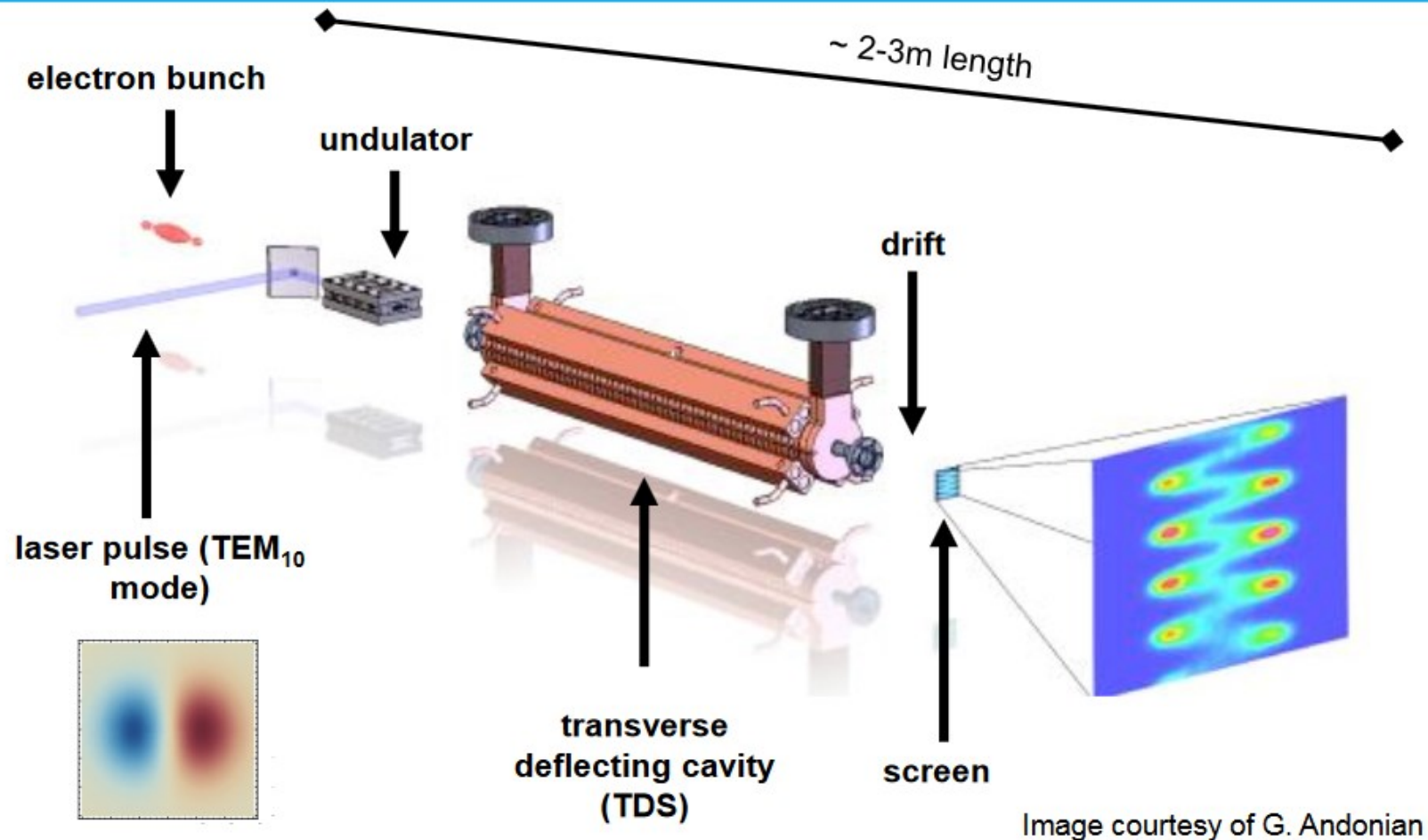


Passive lenses

- Experiments done at Jena, no emittance so far
- Experiments being set up at SPARC



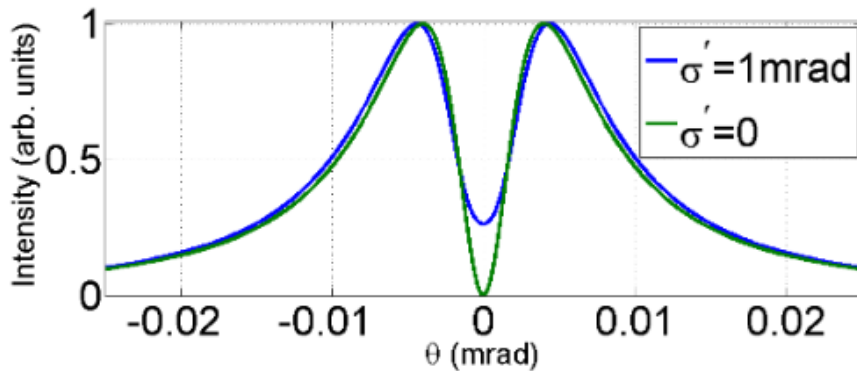
Maria Weikum (DESY / University of Strathclyde): Proof-of-principle experiment for a sub-femtosecond electron bunch length diagnostic



Andonian et al. *Phys. Rev. ST Accel. Beams* 14 (072802).



Single shot emittance measurements based on incoherent OTR



The angular distribution of incoherent TR is **sensitive to beam divergence**: the central minimum is not zero.

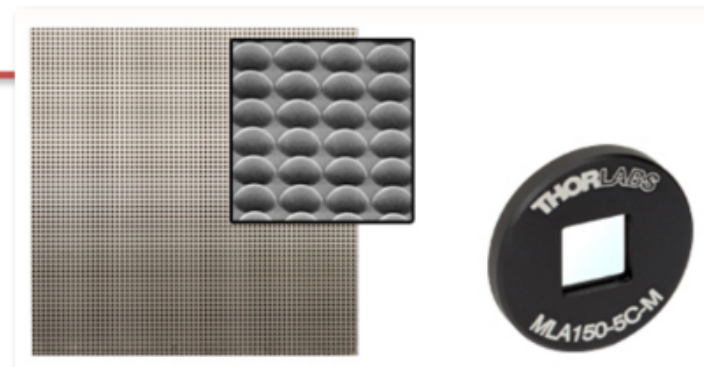
Emittance:

$$\varepsilon = \sqrt{\langle x^2 \rangle \langle x'^2 \rangle - \langle xx' \rangle^2}$$

From spot size

From angular distribution

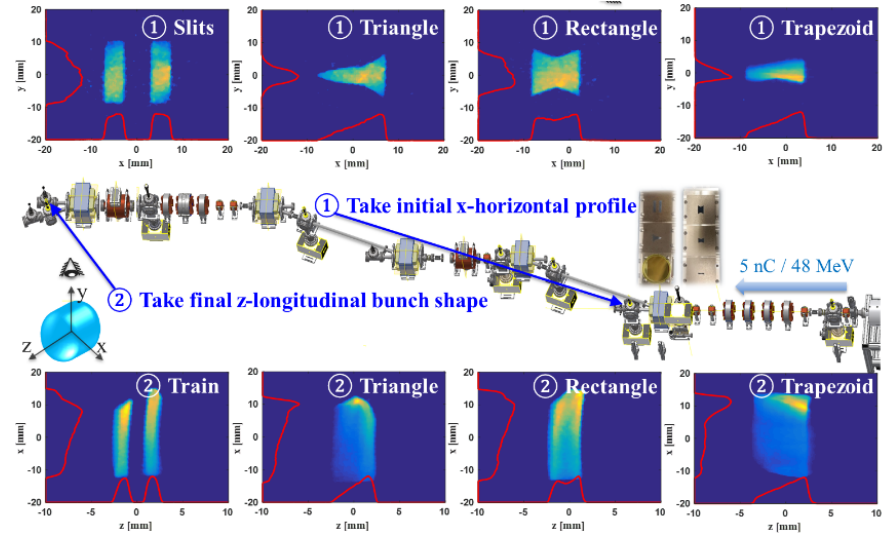
IDEA: Microlens array!



“optical pepperpot”



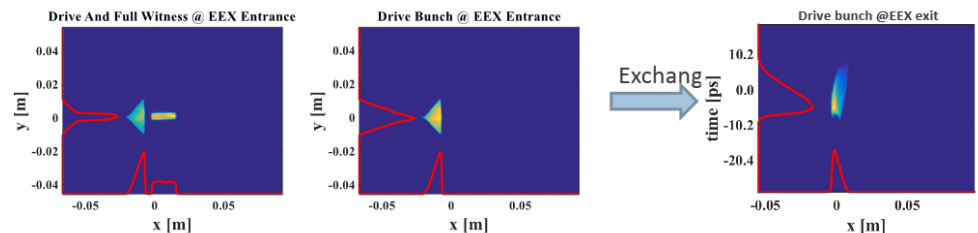
- 3 contributions from Zeuthen (SMI, DW, HTR)
- LWFA positron production
- Emittance exchange bunch shaping demonstration @AWA (DW, PWFA experiments ongoing/under preparation)



Shaping the beam transversely at the EEX Entrance

Longitudinal Profile Measured by TDC

- No (significant) news on stability
- Several experiments starting (SPARC, LUX, FLASHForward, CALA, ELI, ...)
- Proposals towards collider design being pursued



Thanks for your attention!

