

# Terahertz Sources for Particle Acceleration and Deflection

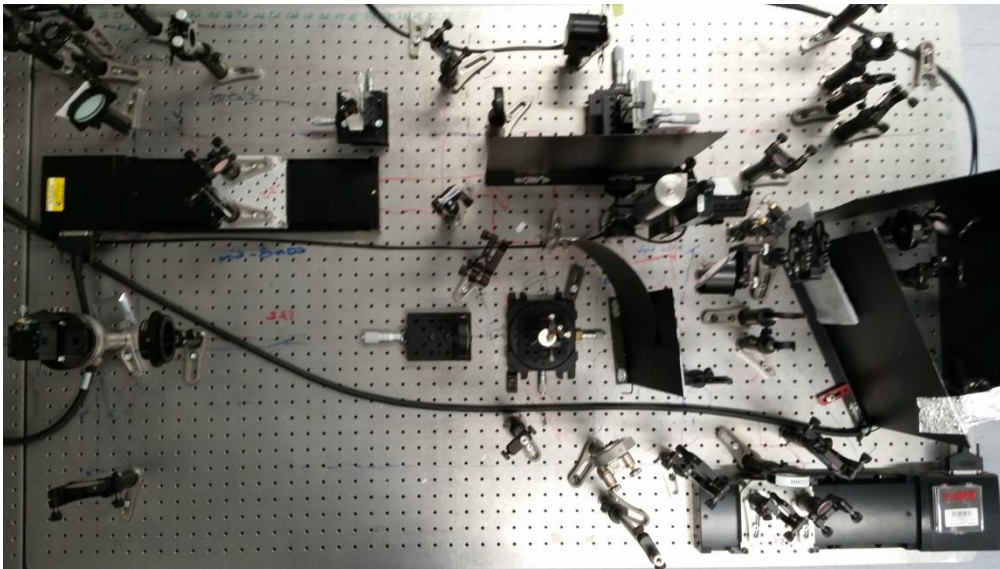
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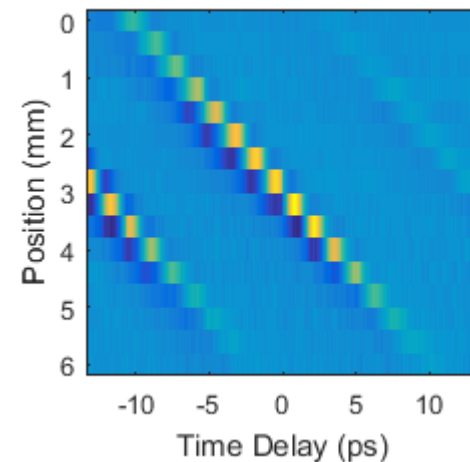
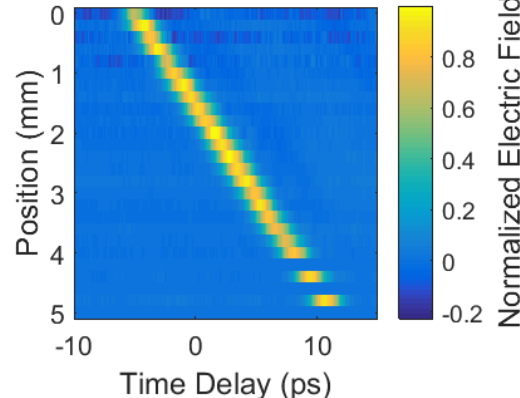
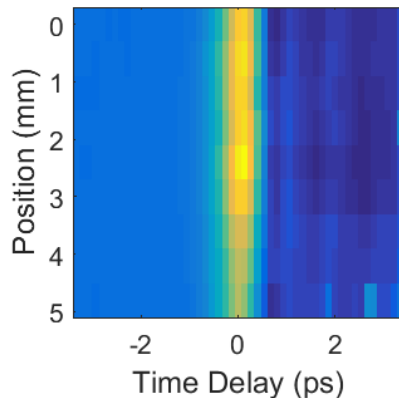
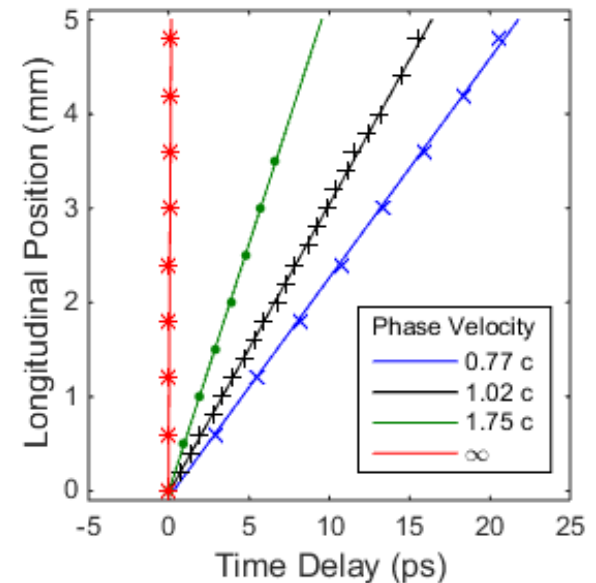
# Travelling Terahertz Source

- Developing a travelling wave terahertz radiation source to co-propagate with a particle beam
- Large electric and magnetic fields of the terahertz pulse could be used to achieve acceleration and/or deflection of the particle beam
- Currently have a working source and looking at ways to increase these field strengths



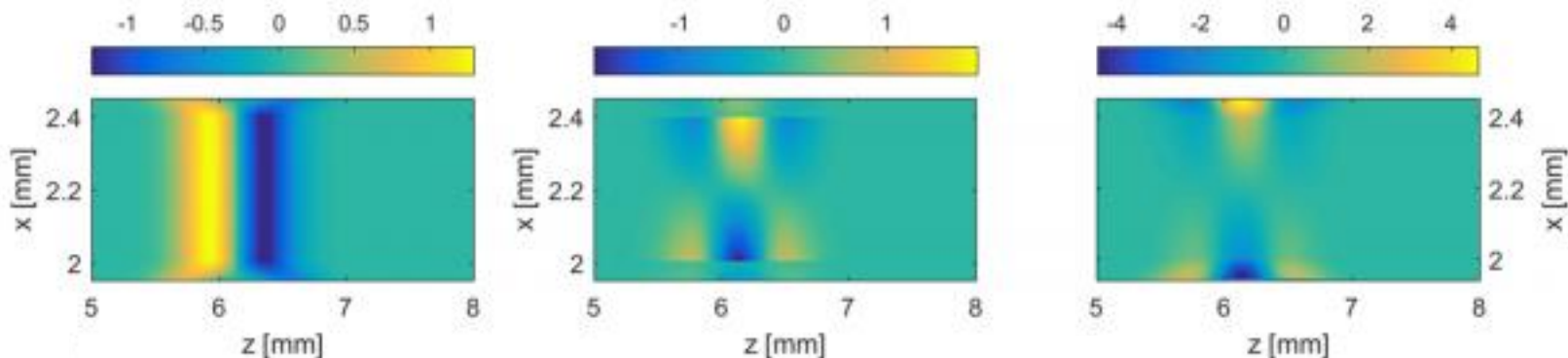
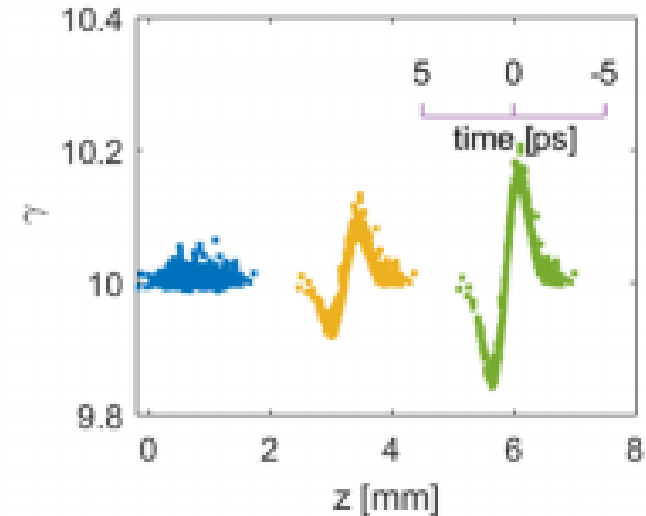
# Results So Far

- We have shown that it is possible to generate a travelling THz pulse with suitable phase velocities
- Velocities between  $0.77 c$  and  $1.75 c$  measured using ZnTe
- Higher field pulses with velocities of approximately  $c$  measured using LiNbO3
- Currently the electric field strengths measured are around  $0.2 \text{ MV/m}$



# Applications

- The magnetic fields produced by the THz pulse could be used in a THz driven deflector.
- This type of source can also be used for particle acceleration by including a second source mirrored opposite. In this case the magnetic fields will cancel in the centre while the accelerating electric fields are be doubled.



# Longitudinally Polarized THz

(Work done by Matthew Cliffe)

- Longitudinally polarized single-cycle THz pulses were generated from a matched pair of nonlinear crystals with opposite polarity.
- Discontinuity in the transverse field produces a longitudinally polarized component of radiation.
- Longitudinally polarized THz pulses can also be used for particle beam manipulation

