X-VISAR: Simultaneous perpendicular line-imaging VISAR

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X-VISAR

- Motivation
- Implementation
- Summary
Why would you want X-hairs on a target?

ORTHOGONAL VELOCIMETRY
MACH: A pulsed power generator for ICE

- 2 MA.
- 260ns rise time or pulse shaping.
- Up to 200 kbar.
- Quasi-Isentropic Compression Experiments (ICE).

http://www3.imperial.ac.uk/shockphysics/facilities/mach

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MACH: A simple strip-line
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Target design
COMSOL modelling

Straight

Taper

Courtesy of Sam Stafford

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Implementing a novel diagnostic

X-VISAR
Optical Arrangement

6W 532nm Laser →  X-hair formation → Beam Splitter → Image Relay

→ Interferometer → Streak Camera → DSLR

→ Interferometer → Streak Camera → DSLR

Target
Optical Arrangement

• Laser
  • Shuttered
  • Multi-mode fibre
Optical Arrangement

- Laser
  - Shuttered
  - Multi-mode fibre
- X-hair formation
- Beam-splitter (BS1)
- Target
Optical Arrangement

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  - Shuttered
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- X-hair formation
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- Image relay
Optical Arrangement
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- Laser
  - Shuttered
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- X-hair formation
- Beam-splitter (BS1)
- Target
- Image relay
- VISAR Interferometers
- Streak Cameras
- Canon DSLRs
• Adjust contrast with Mirror on translation stage.
• Adjust fringes with output beam splitter
Optical Arrangement

- Laser
  - Shuttered
  - Multi-mode fibre
- X-hair formation
- Beam-splitter (BS1)
- Target
- Image relay
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Optical Arrangement
Optical Arrangement

MACH Target

150 mm + 300 mm - 400 mm

BS1

BS2

BS3

750 mm

Laser from fibre

VISAR

Streak Camera

VISAR

Streak Camera

750 mm

750 mm

150 mm

150 mm

500 mm

750 mm

-400 mm + 300 mm

MACH Target

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System Alignment

- Three alignment lasers (<5 mW):
  - Main beam replicator
  - Interferometer alignment
    - With beam expander
    - Counter propagating beam
- White Light LED tile & filters
White Light alignment

- White LED tile
  - 532 nm Line Filter (FWHM 1nm)
  - 532 nm line filter (FWHM 10nm)
  - ‘White’ light (no filters)
- SLR lens
  - Throw image & focus
- Diffuser
- Instability (up to 130µm range)
Summary

• Not data presently
• ~£30,000 excluding laser and streak cameras.
  • Mostly 2” optics.
• Challenges
  • Anti reflection windows.
  • X-hair analysis.
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