LUX Electron Beam Diagnostics

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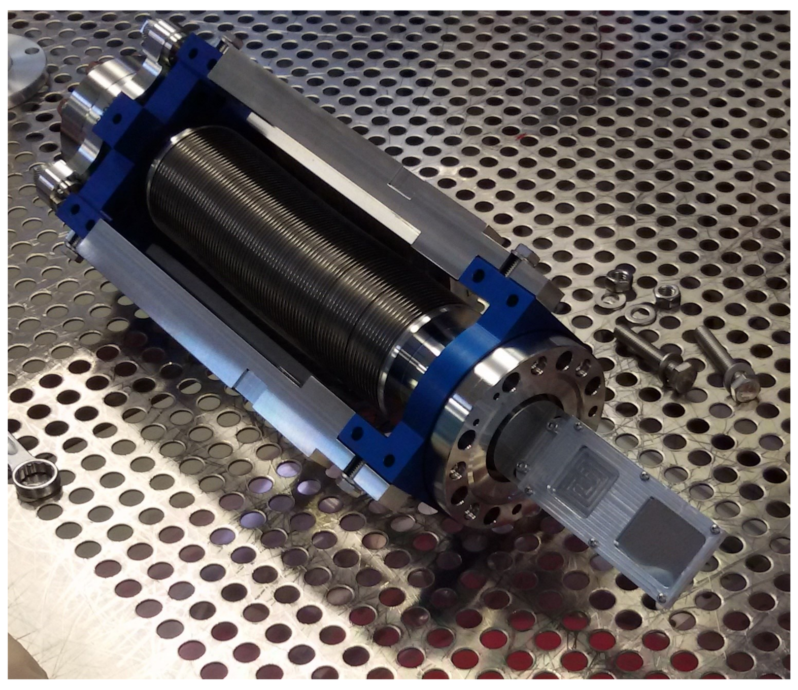
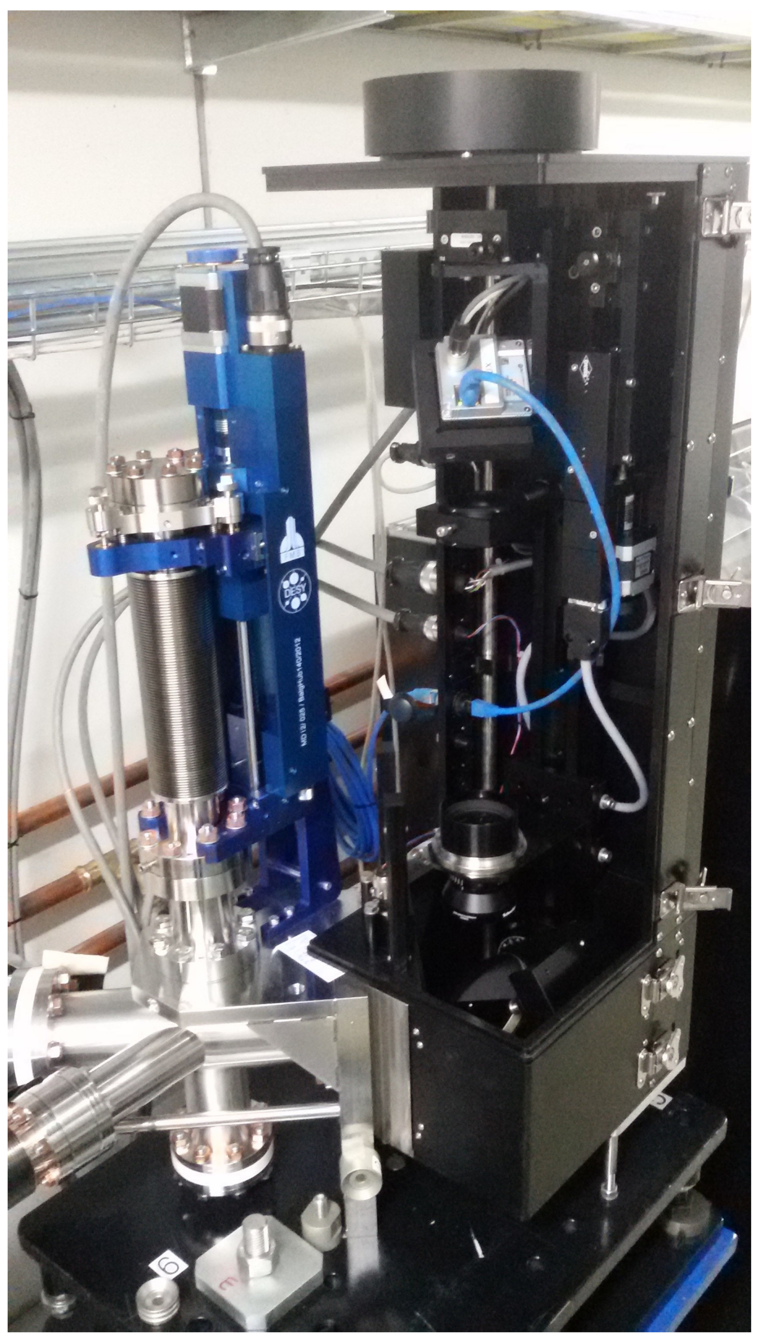
Transverse Electron Beam Profile Screen YETI

Design

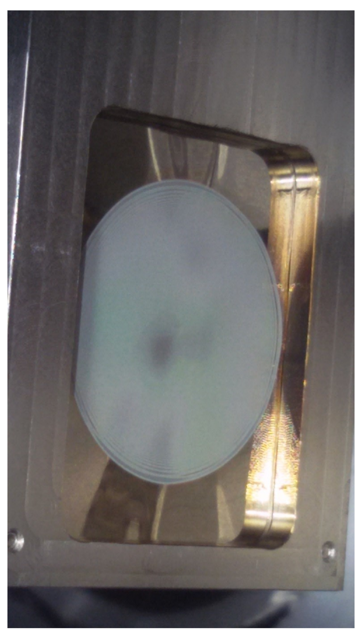
- screen under 0° to e-beam
- e-camera looking under 45° on screen back side in order to avoid CTR signal
- use tilt-opjective to rotate focal plane onto screen surface
- 2nd camera to look on screen front side to detect laser scattering

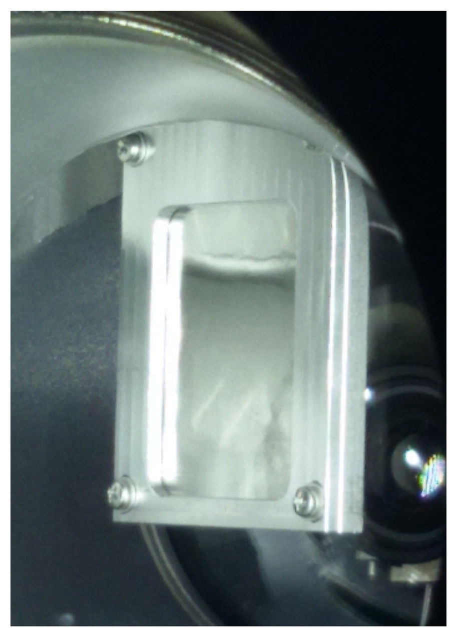


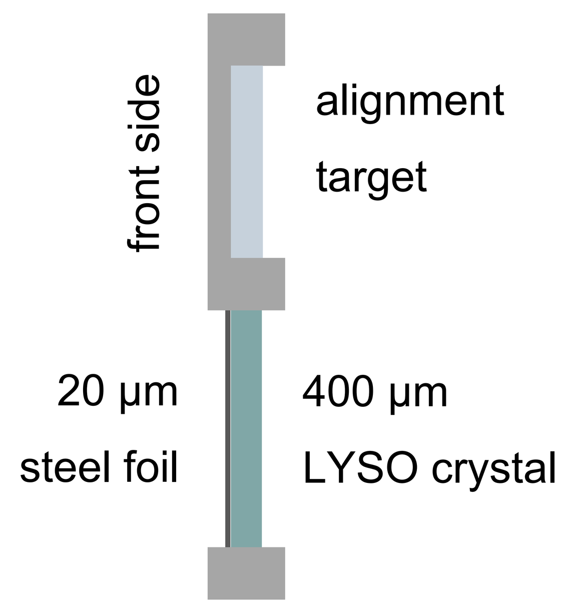


Function

- TW-Laser and electron beam from target
- 400µm thick LYSO:Ce scintilator crystal for spatial electron detection
- LYSO has a higher spatial resolution (~20µm) and photon yield (factor 2) compared to YAG screen. [from discussion with Gero Kube, MDI, DESY]
- Block laser light with 20µm stainless steel foil in front of LYSO
- Reflection of scintilator light on steel foil increases signal by factor of ~2
- Measure transverse beam profile
- First measurements of e-beam divergence and pointing jitter


laser spot burned into steel foil


but no damage of LYSO crystal behind



Electron Dipole Spectrometer eSPEC

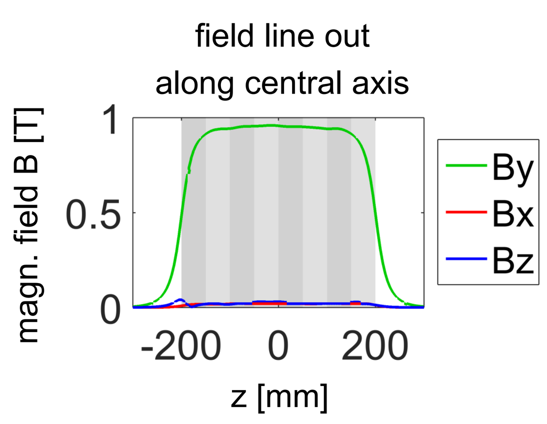

LUX electron spectrometer eSPEC designed and built by C. Werle and Enrique Rodrigez Garcia[2]
[2]ELI beamlines, Praque

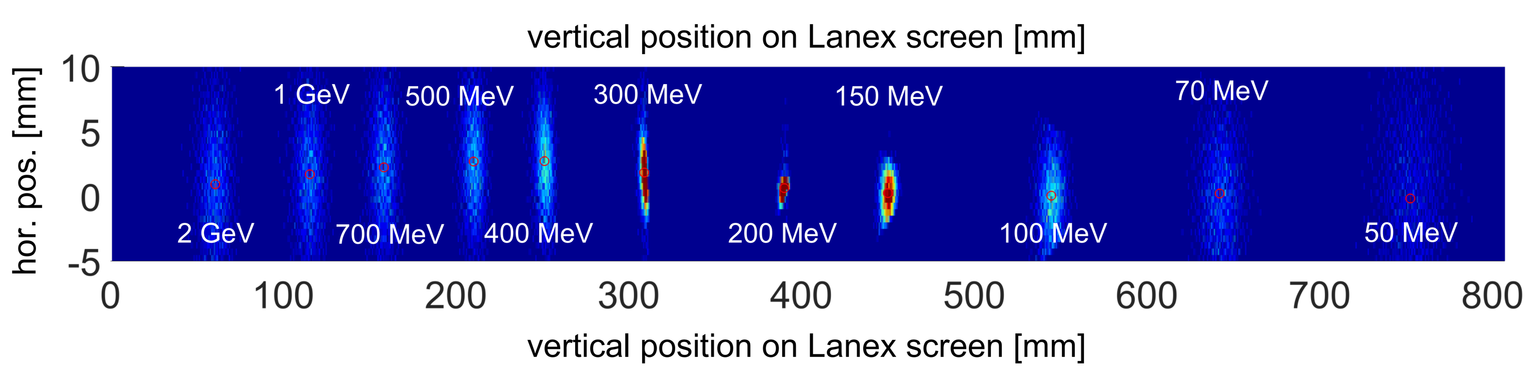
Design

- 400mm long permanent dipole magnet
- build out of 50mm x 50mm magnetic bricks
- 0.95 T peak field
- Lanex screen under 45° to laser axis directly taped on chamber to keep electron scattering to a minimum

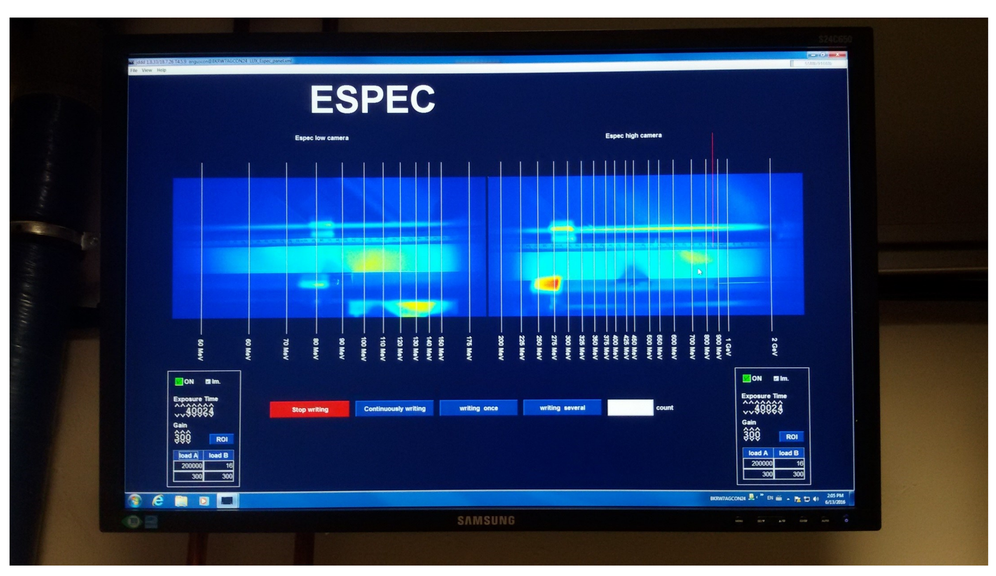
Calibration

- field inside dipole gap is not constant - but varies with the magnetic brick orientations
- change of field in the range of 1%
- Consider full 3D-fieldmeasurement for calibration including fringe fields
- energies from 50MeV to 2GeV detectable
- Yet no server based image post processing
- later: energy resolution ~1-4% [simulated by Carlos-Jose Astua, ELI beamlines, Praque] manly determined by e-beam divergence and camera resolution
- Use statistics in order to reduce error induced by pointing jitter






Two cameras looking on Lanex screen. A mirror is used to prevent radiational damage



eSPEC panel everybody is staring at. Image enlightend to see Lanex and scale (no electrons!)

LAOLA.

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