LGS diagnostics benches Version 1
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10k guide for hardware

Coude Lab

Minimum Requirements:

- 589nm laser joules per pulse (Si amplified photodiode, fast readout, filter, diffuser)
- Easy collimation tool (melles-Griot shear plate, 50mm?)
- Wavelength (Na cell, visual reading in lab, webcam for datalogging purposes ?, part available –yes talk to Ed)
- Bandwidth (Optical spectrum analyzer, part from Viswa, EXFO SA series, part available)

Extras:

- Near field camera (simple zoom lens)
- Far field camera (1000mm focal length lens)

Layout:

- Move 660nm stimulus HeNe to top of bench, creates space for diagnostics
- Allow for 1% beam into diagnostics from main beam OR by manual translation of fold mirror 1% beam from laser bench. Why- so laser diagnostics can be operated with shutter closed.

Questions:

- Na cell to use? Talk to Ed- if inside laser bench don't require on diagnostics bench.
- Need to get optical spectrum analyzer from Viswa/Ed In Paloamr
- Can beamsplitter cube and tip-tilt mount be replaced by a flat mirror? Can use FSM to switch between red and 589nm
- Are near and far field cameras required?
- Sync of photodiode output with laser trigger to get power per pulse. Should be straightforward- sync to DAC in pc. Chris Shelton. Software help.
- Is spectral analyzer behind the Na cell ok? Yes if Na cell on diagnostic bench.
- 589nm etalon or Schott RG630 filter on photodiode? IR blocker nothing fancy
- Is photodiode area large enough for accurate average power calculation? Use 2 photodiodes – one for average power, one for joules per pulse
- Switchable versus fixed gain for photodiodes?
- Part number for 1% beamsplitter in laser bench? CVI 1% partial reflector
- What filters are required for each component?

- Use AR coated wedge for 1% reflection into diagnostics
- Beam is ~1cm

LLT diagnostics bench

Minimum requirements:

- 589nm Power per pulse (Si amplified photodiode, fast read-out, AC supply, filter, diffuser)
- Easy collimation tool (shear plate, 50mm?, webcam)
- Near-field (pupil) image of 589nm beam (+660nm beam??)
- Far field (spot) image of 589nm beam for FWHM
- Sky viewing mode (could be separate camera) for LLT alignment
    - 60mm lens: 17micron/arcsec→ 1.29' by 0.95' ½" format
    - 300mm lens: 83micron/arcsec → 6.4' by 4.7' ½" format
- Need to image secondary onto this camera for pupil alignment of LLT to 200"→ manual translation of lens ahead of sky viewing camera
- Is taking a star image in the data room very important? Sky viewing camera can be a Watec (cheap, cctv, bnc output) if this is the case. Other options are to use the far field camera and redirect the beam, or use a network webcam to keep costs down.

Questions:

- Do we need 589nm and 660nm beams imaged onto Near-field camera for alignment check? Yes very helpful. Use Q3 filter for this.
- To what extent can we use top of the range network webcams for images that need to be logged? GiGE cameras are great but 1900 for 1/3" format… just an idea
- What filters do we need on each component?

Layout:

- FM3, Q3 etc will be located on diagnostics bench, but in same relative positions.
- FM3 will be relocated to true exit pupil position (~18mm away from LLT mirror cell according to zemax), this gives us more space
- We may need to use front and back of optical bench- space is tight, plus Hal and I need to double-check mouting space to LLT
- Likely use a 1-2deg AR coated wedge to give 2 beams for near field and far field camera
    - Can we use 2 off the shelf AR coated wedges and bond with index matching glue?
- Cabling will of LLT will be tidied during installation of diagnostics bench
- Move Q3 to diagnostics 1% pick-off.

Wavefront map:

- Would be very useful to have a picture of the wavefront.
- Can we think about a simple Shack-Hartmann, designed for recording static aberrations, rather than one with a very fast frame rate?
- Need (micro?) lens array, not so fancy a camera, software to interpret spot movements to wavefront
- For both Coude and LLT diagnostics benches??

F/17 lenset array, pitch 1mm 10 by 10- Viswa
Would be good to gave this at both Coude and prime focus, but most important at prime focus. Possible to run at 50Hz. Fast but noisey ok. Pulnix is 60Hz.

Data/Software:

- LLT photodiode into BTO computer
- Other inputs:
  - LLT near field camera
  - LLT far field camera
  - Possible sky camera (simple network)
  - Possible shear plate camera (simple network)
  - Coude photodiode (output needs to be synced with laser pulse)
  - Coude shear plate (simple camera)
  - Likely a few more cameras in the future (shack-hartmann, I asked Ed about near and far field images at Coude)

- John Angione will bring LGS pc (currently in his room) to Caltech (today?) for laser diagnostics data logging.
- What is the minimum data logging required
  - for next run
  - for future runs
- What are options for data logging?
- What is required in data room? 2 monitors? 1 for LLT diagnostics, 1 for Coude??
- I'll need help for this