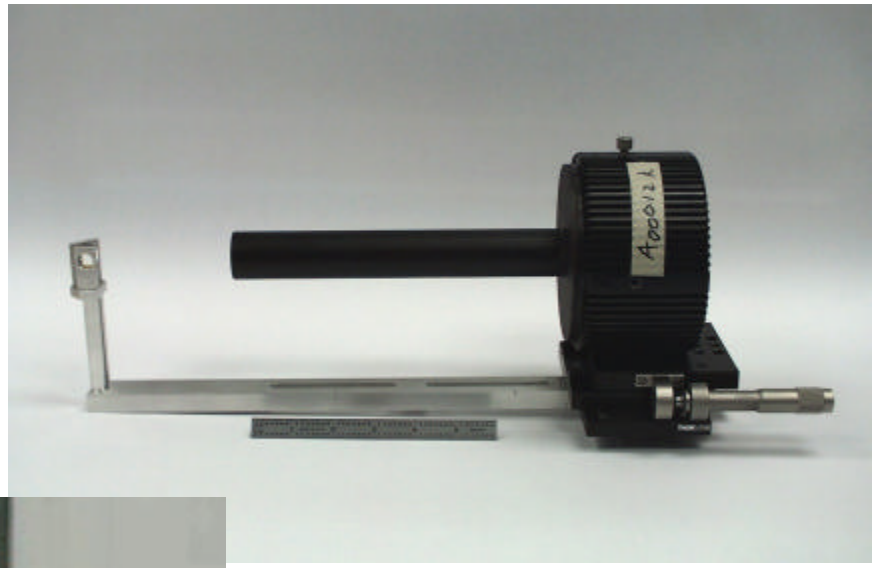
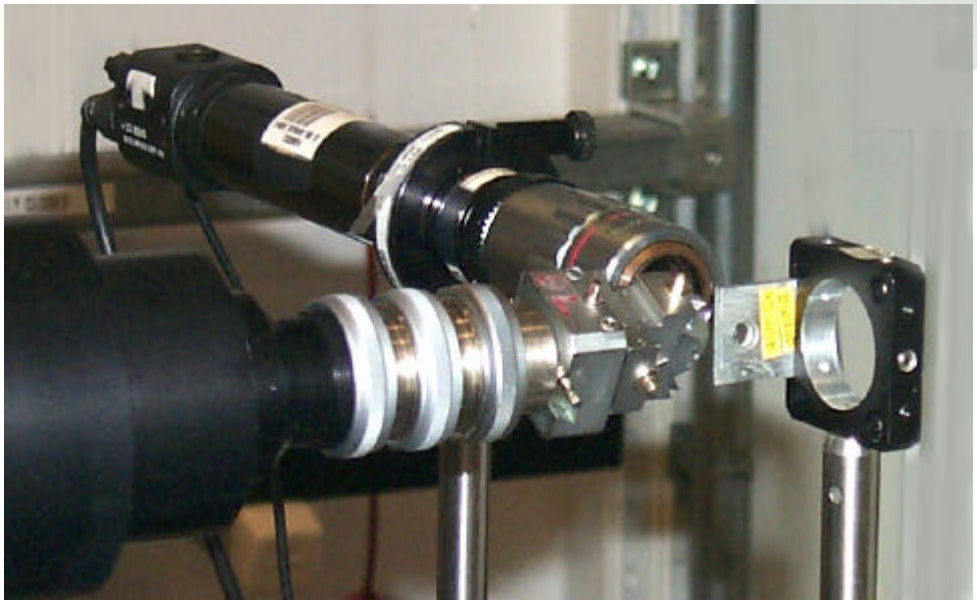
Toys & Tools

X-ray Cameras

Large -- Small

Expensive -- Cheap





Applications

- High-resolution Imaging (e.g. radiography)
- Diagnostics (e.g. beam profile analysis)

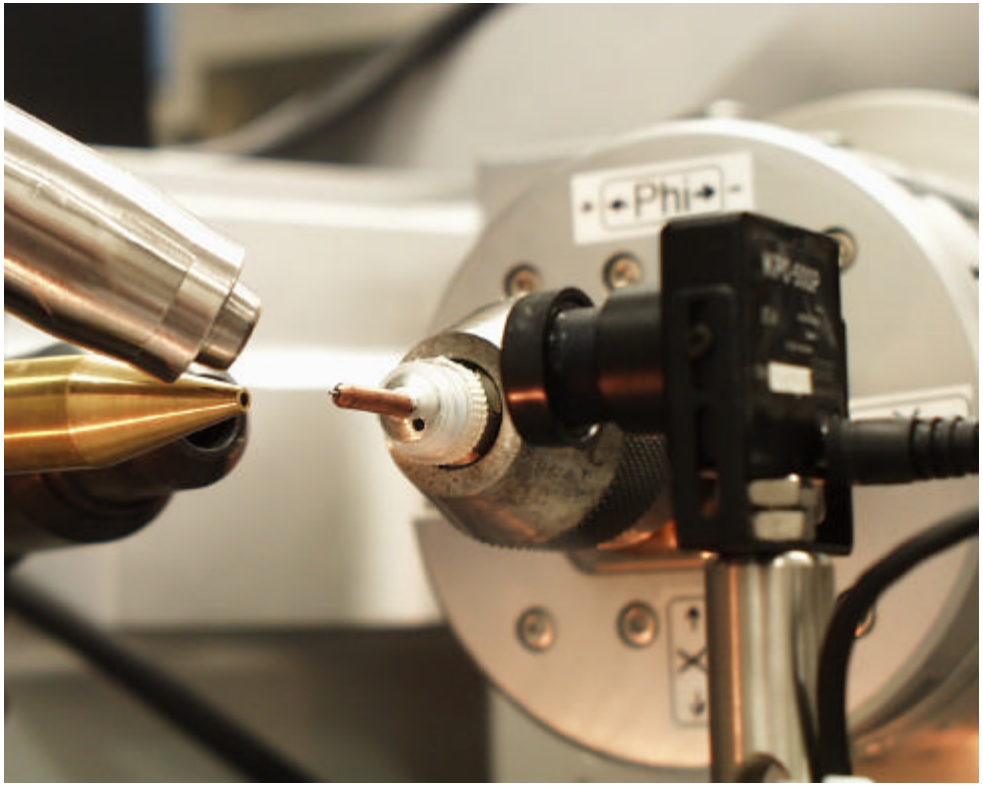
Design Criteria

- Wavelength (X-ray, VIS, IR)
- Size
- Versatility

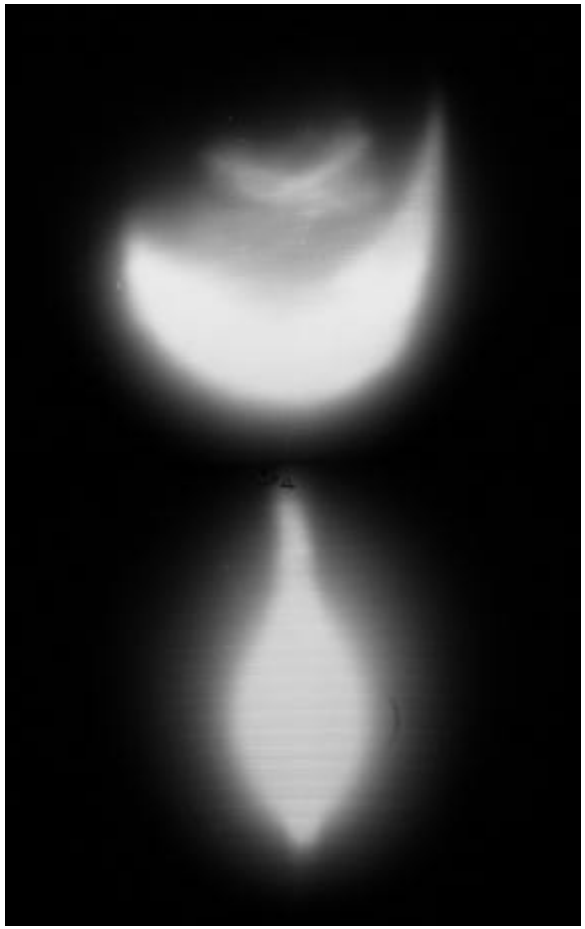
The bottom line: cost & efforts vs. usage

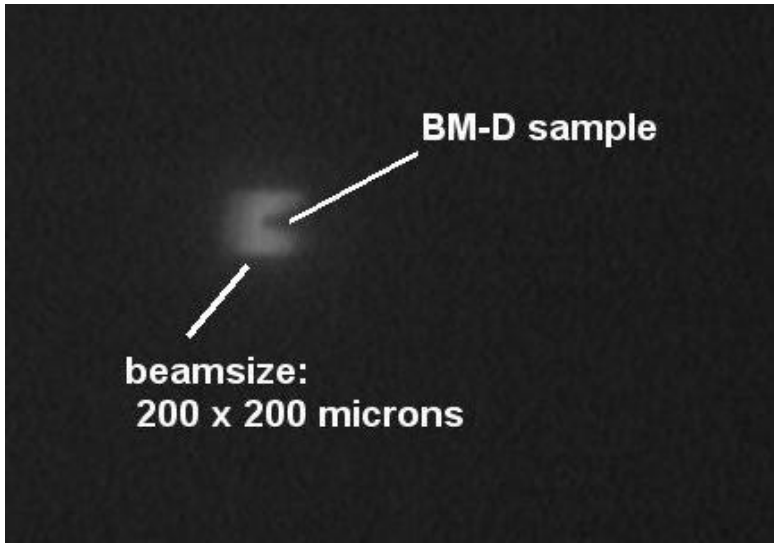
• Low-end:	$300	Video camera with lens and posphor
	$400	Color monitor
• High-end:	$$$	Research grade CCD camera
	$$	Computer imaging system

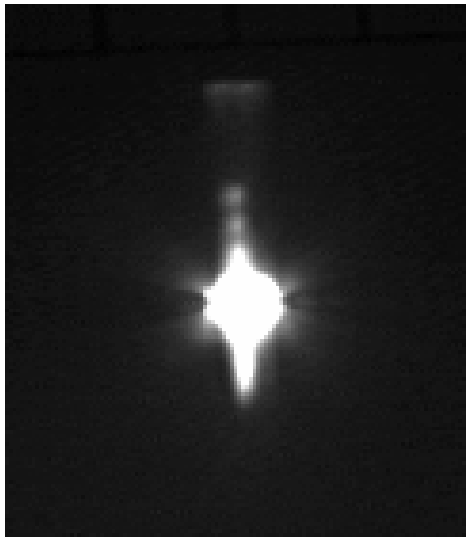
BioCARS beam diagnostics camera



Camera	$ 130
Ce:YAG crystal	$ 130
TV Monitor	$ 450







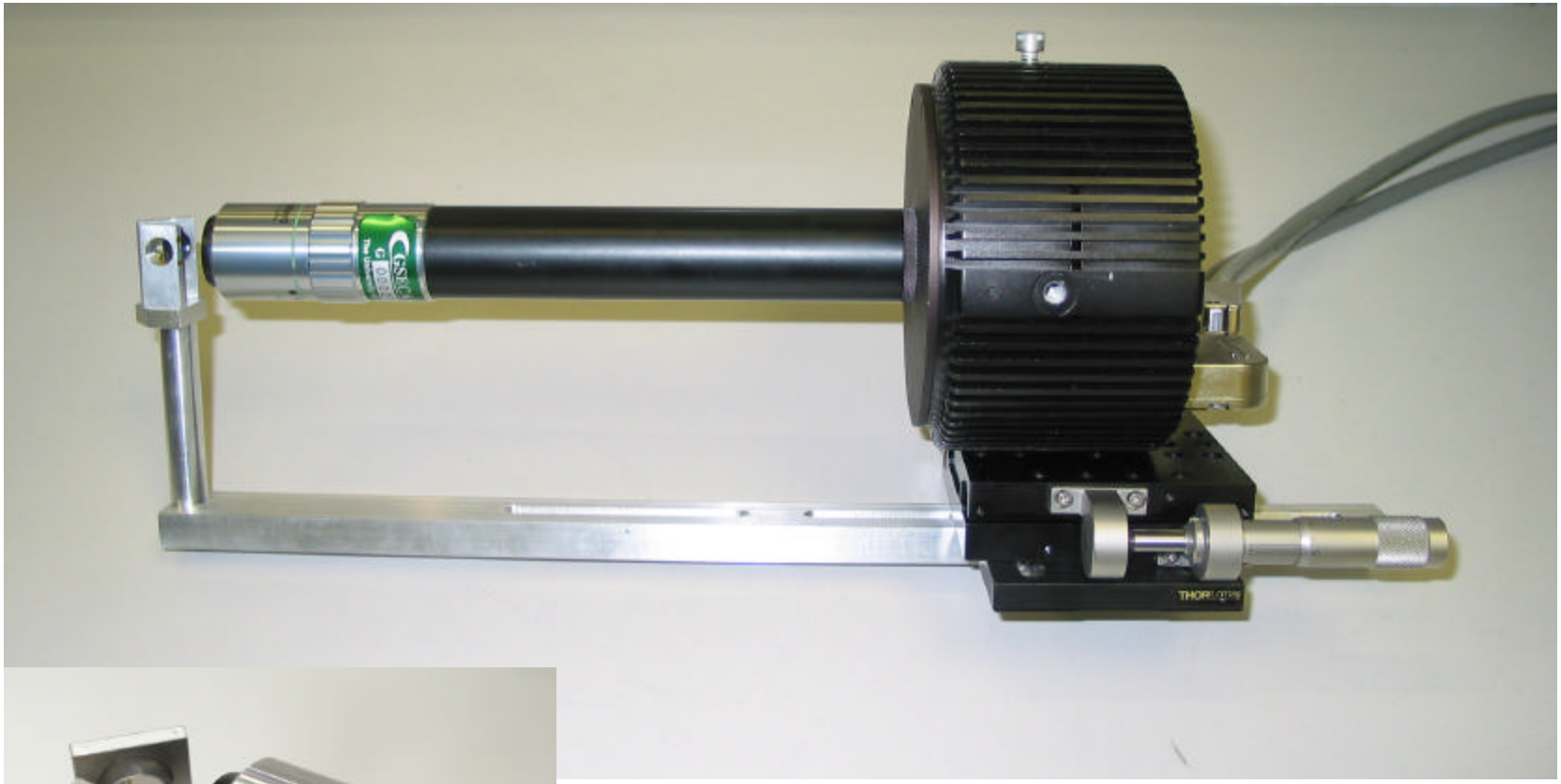
Field of View
640 x 480 pxl
3.6 x 2.7 mm^2

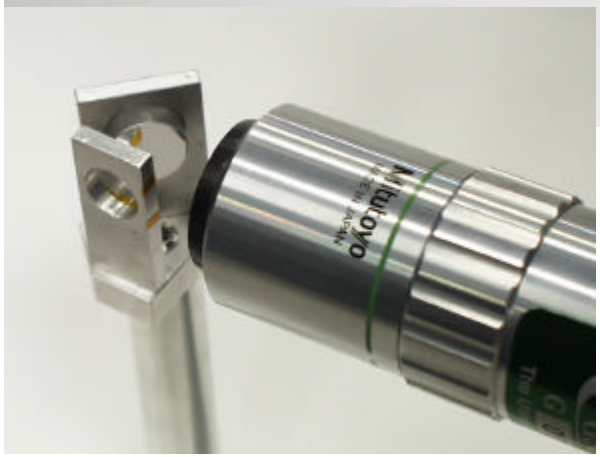
Resolution
~ 6 μm

GSE-CARS X-ray imaging systems

System components:

- YAG crystals 500μm or 5 μm
- mirror to get CCD out of direct beam
- Mitutoyo long working distance objectives (5x, 10x, 20x, 50x)
- Cameras:
  - Roper Scientific PentaMax and MicroMax
    - 5 MHz, 6 frames/sec at 650x510 pxl resolution
    - exposure times <1 msec to >60 sec
    - 12 bit ADC, excellent signal/noise ratio
  - Video cameras (cheap, fast)



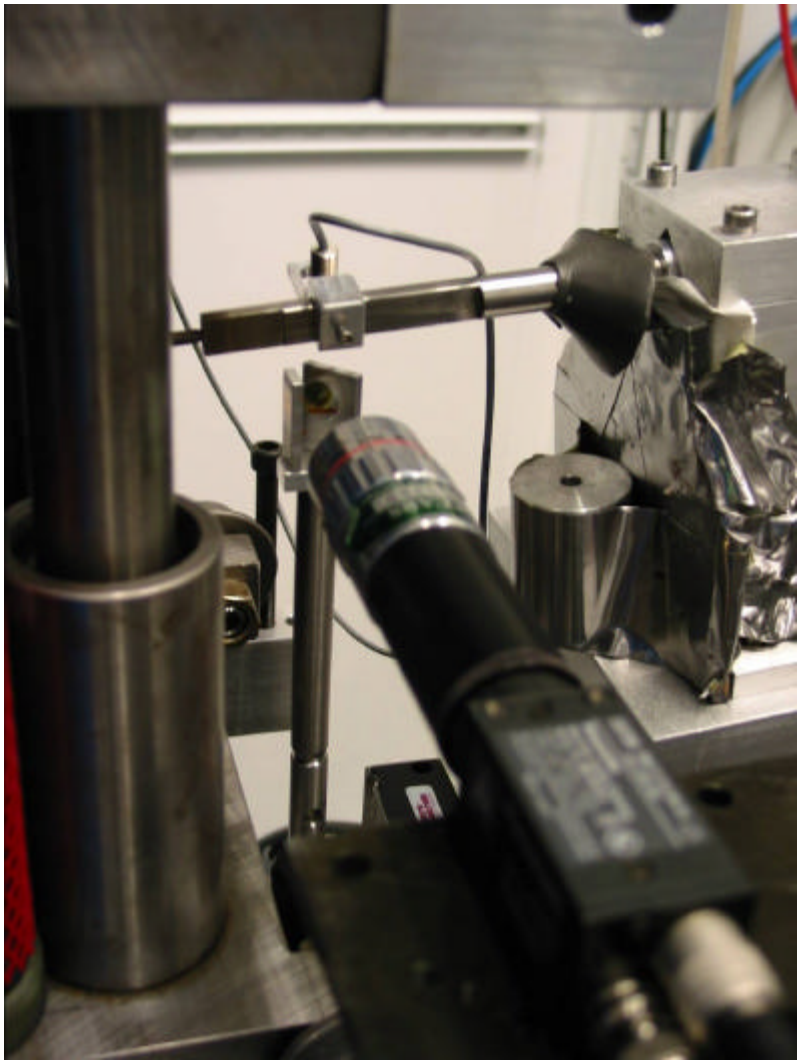


Top: Imaging system with Roper Scientific PentaMAX

Left: Detail view of YAG crystal and mirror

Applications

- Microtomography
- Imaging of samples in the multi-anvil press
- Diagnostics for Kirkpatrick-Baez mirror alignment and focusing (both large and small mirror systems)
- Diffractometer alignment by mounting small lead sulfide crystal on goniometer head, looking at shadow (absorption image) on YAG crystal



Imaging system installed at the high pressure experiment.