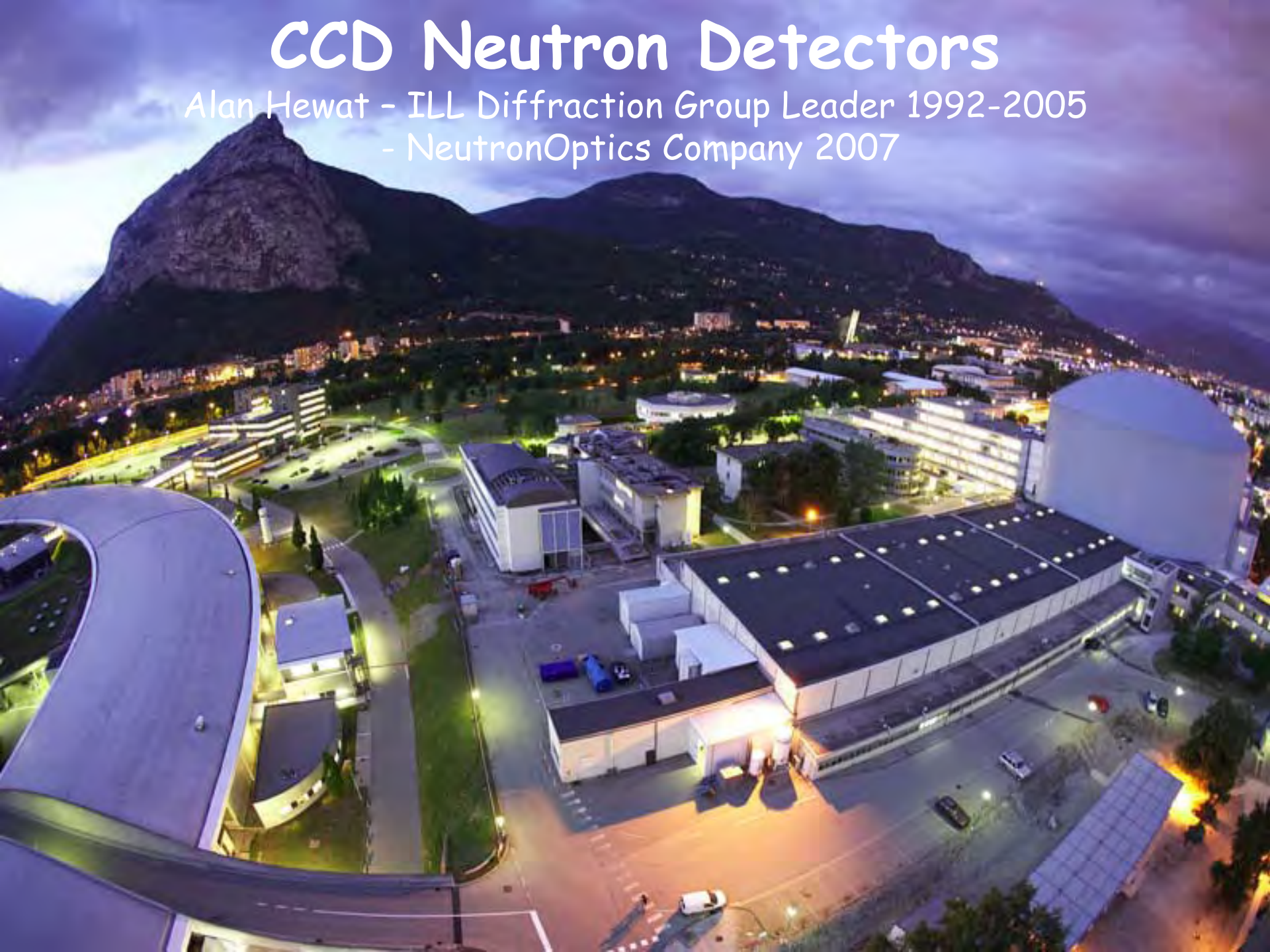


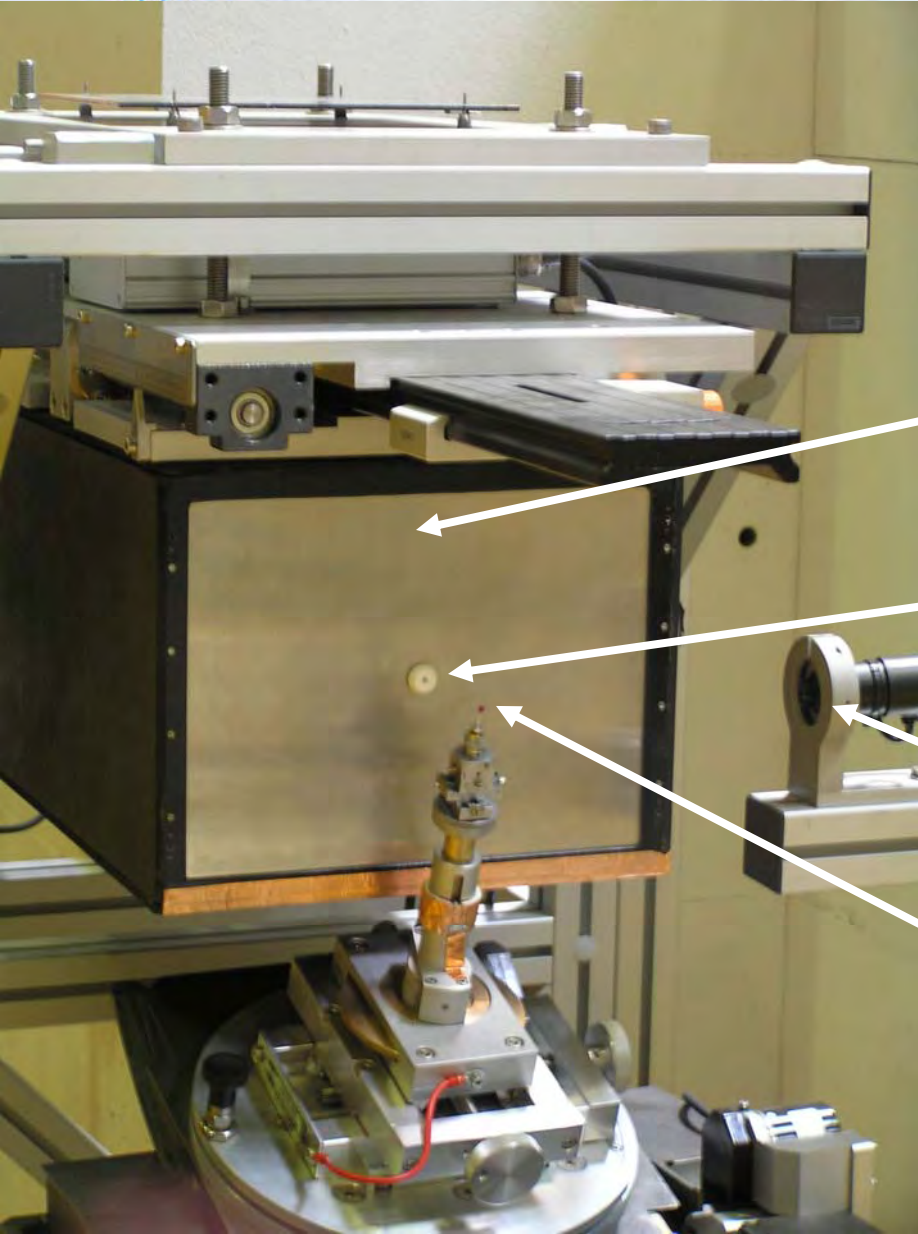
CCD Neutron Detectors

Alan Hewat - ILL Diffraction Group Leader 1992-2005
- NeutronOptics Company 2007



ORIENT EXPRESS, a CCD detector

B. Ouladdiaf et al. I.L.L., Grenoble 2004



Ouladdiaf, Archer, McIntyre,
Hewat, Brau, York

Proceedings of the ICNS Sydney
Physica B (2006)

CCD detector in backscattering

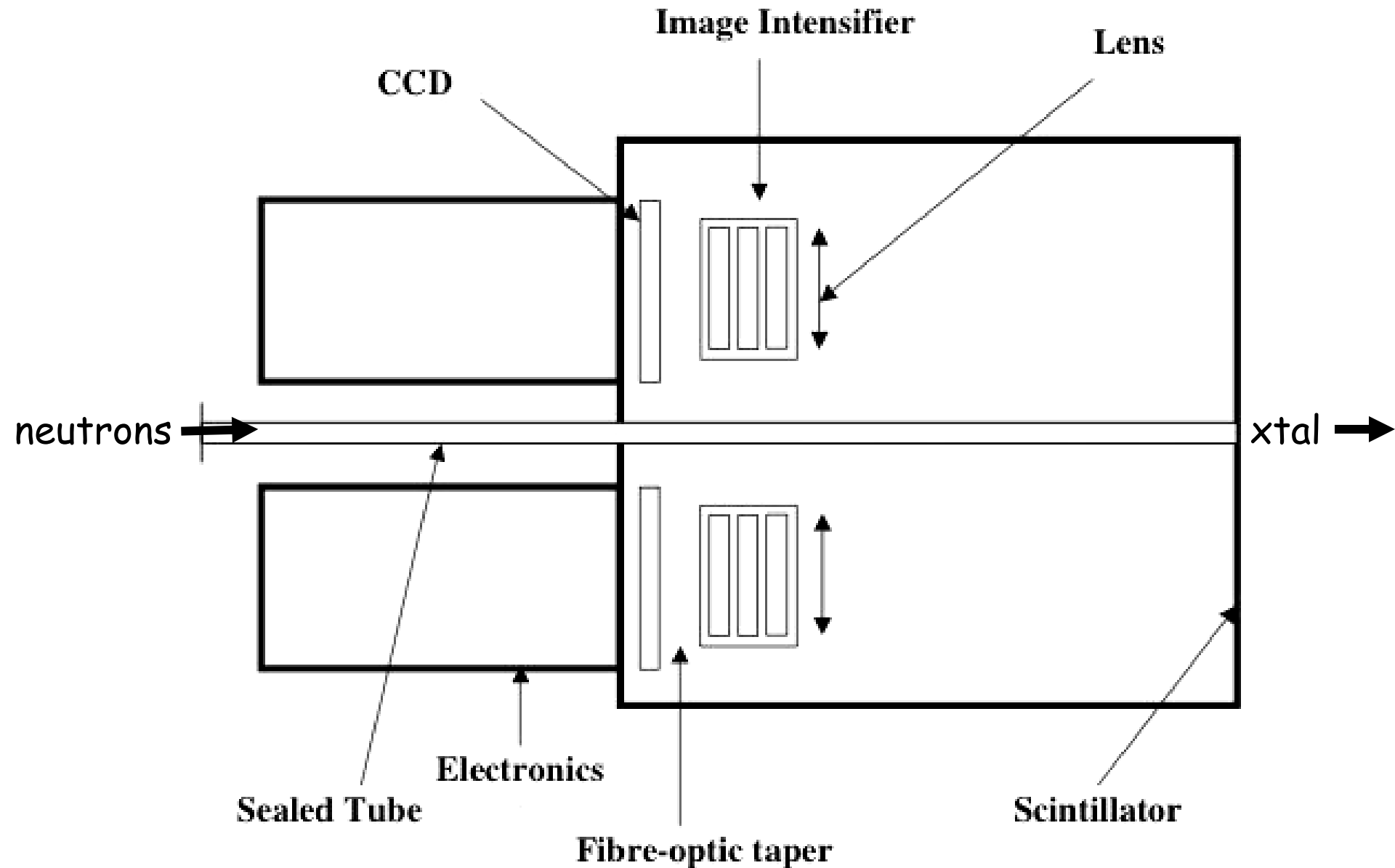
Neutron beam

TV camera for crystal alignment

Crystal on goniometer

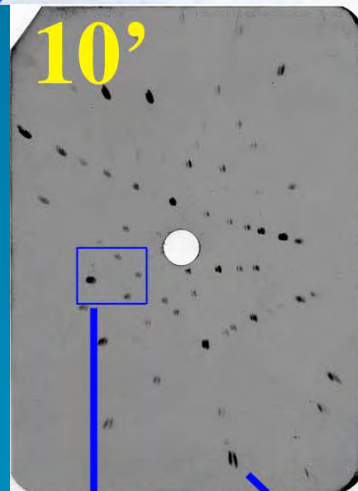
ORIENT EXPRESS, a CCD detector

B. Ouladdiaf et al. I.L.L., Grenoble 2004



ORIENT EXPRESS, a CCD detector

B. Ouladdiaf et al. I.L.L., Grenoble 2004

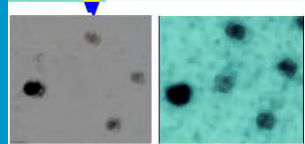
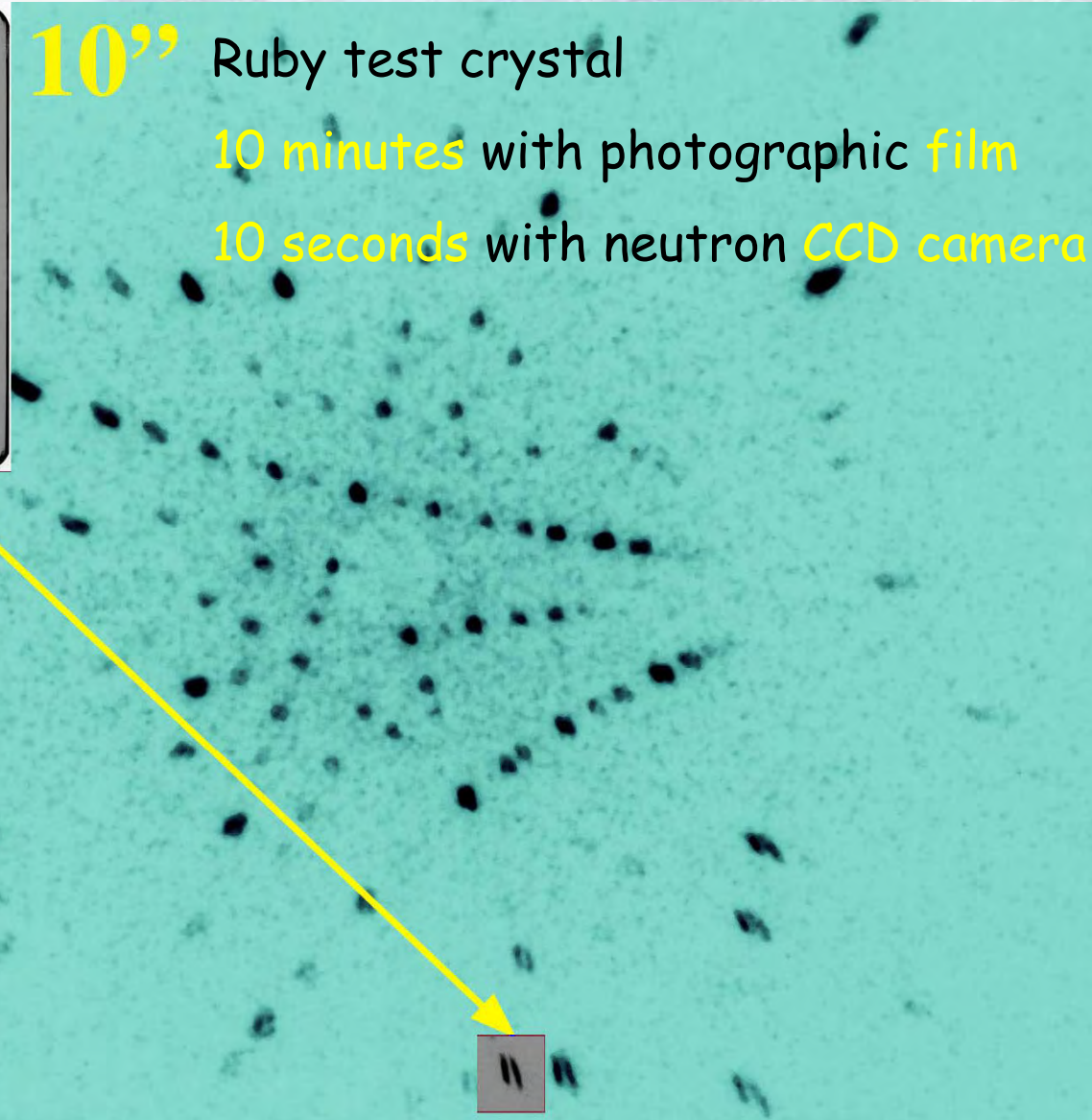


10''

Ruby test crystal

10 minutes with photographic film

10 seconds with neutron CCD camera





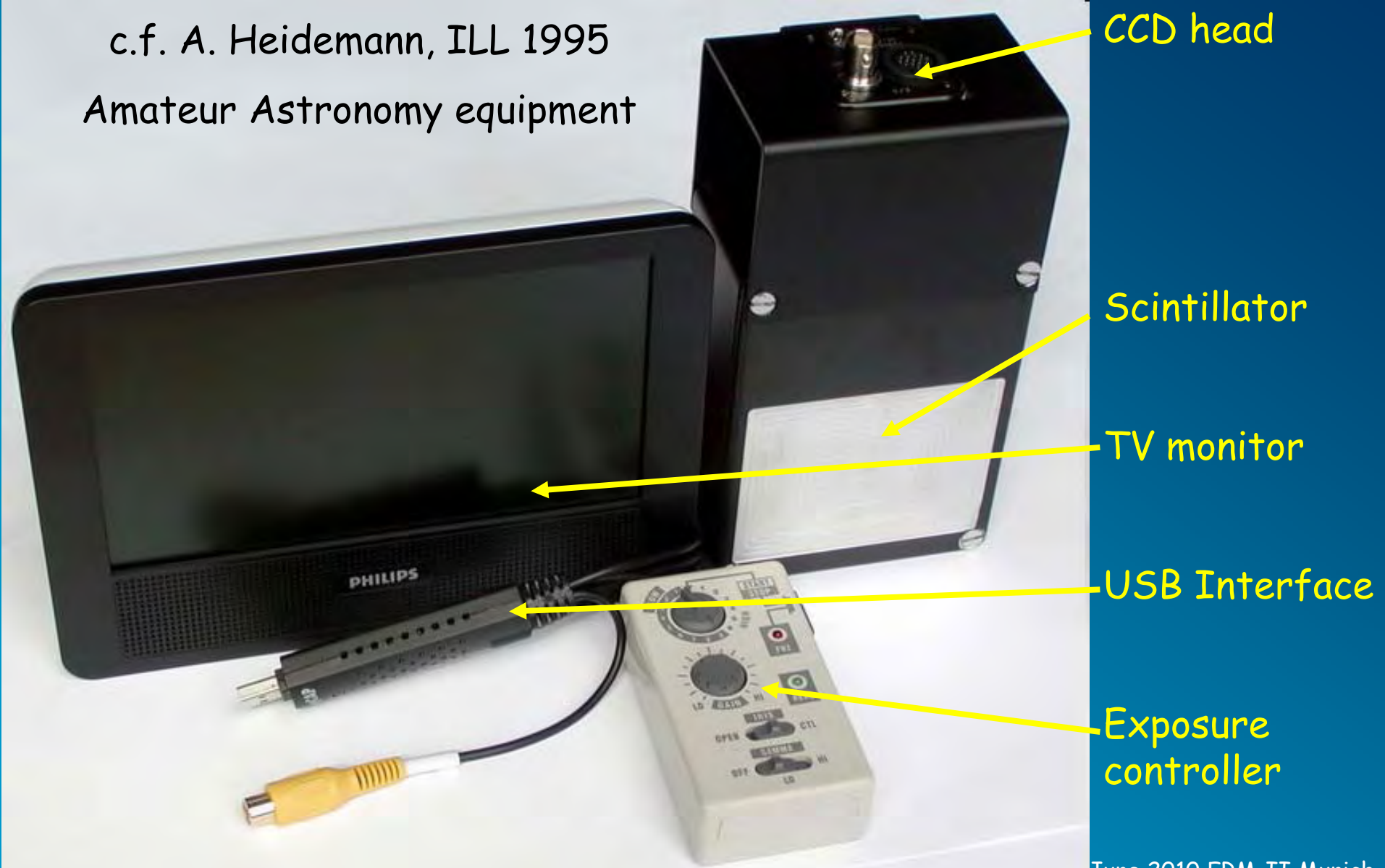
80x60mm neutron CCD camera 2006

<http://neutronoptics.com/>



c.f. A. Heidemann, ILL 1995

Amateur Astronomy equipment



CCD head

Scintillator

TV monitor

USB Interface

Exposure
controller



NeutronOptics camera applications

<http://neutronoptics.com/>



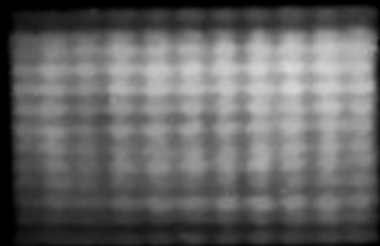
Cd pointer in weak 10^3 beam



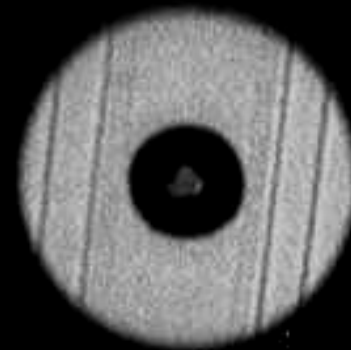
Shadow of vanadium can



SNS-SNAP collimator



Cryostat tail on D22 SANS





NeutronOptics Clients

<http://neutronoptics.com/>





Computed Neutron Tomography

B. Schillinger et al. FRM-II Munich 2009



Rat lung filled
with gadolinium
contrast agent.

ANTARES
CCD camera at
FRM-II Munich

1 June 2010 FRM-II Munich



NeutronOptics camera applications

150x120mm Camera, FRM-II ANTARES beam-line





NeutronOptics camera applications

150x120mm Camera, FRM-II ANTARES 2 seconds





Neutron camera applications

150x120mm Camera, FRM-II ANTARES 1 second



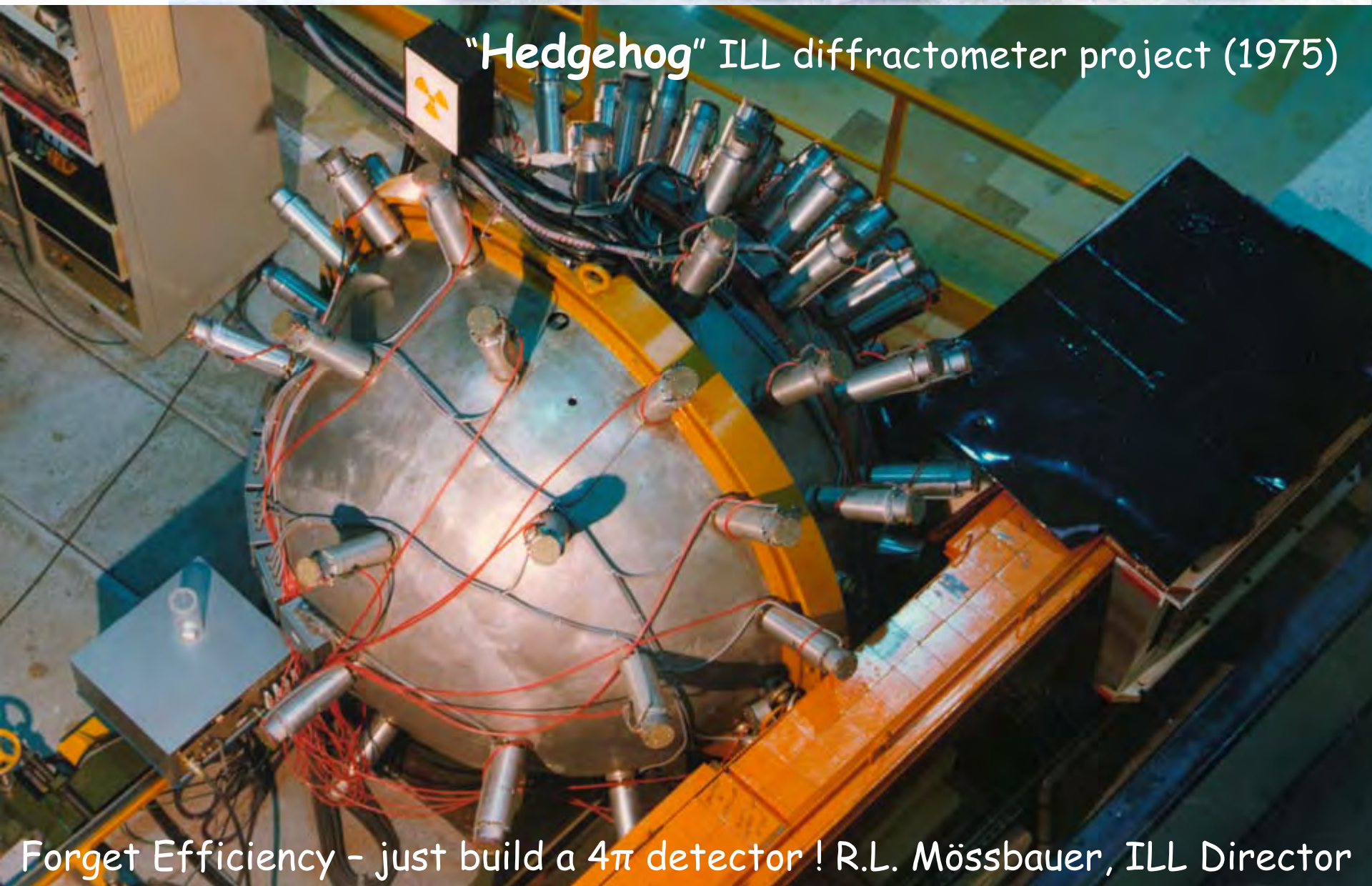


" 4π " Real-Time CCD Detector 1975

Large multi-detector at ILL (Maier-Liebnitz)



"Hedgehog" ILL diffractometer project (1975)



Forget Efficiency - just build a 4π detector ! R.L. Mössbauer, ILL Director

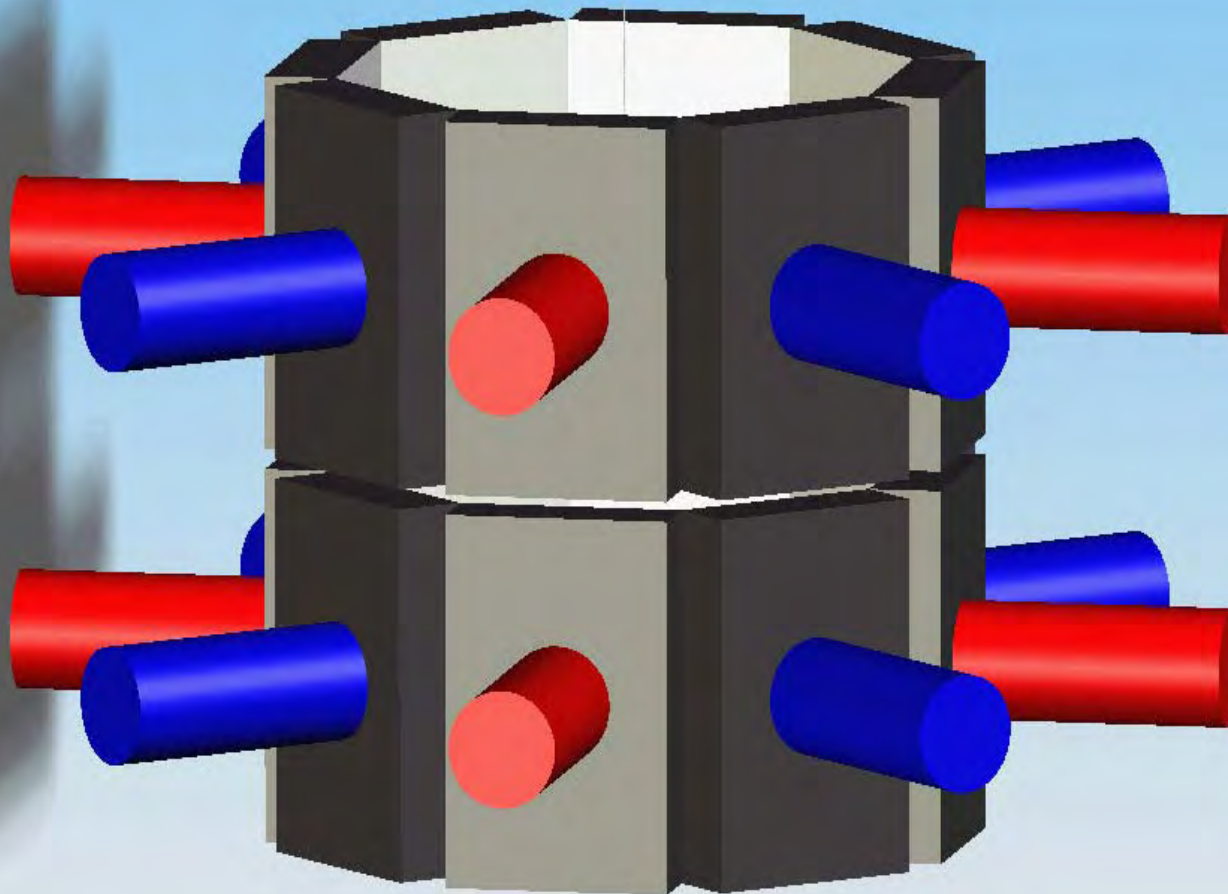


" 4π " Real-Time CCD Detector 2006

Cylindrical **C**CD **L**aué **O**ptics **P**hoto **S**cintillator



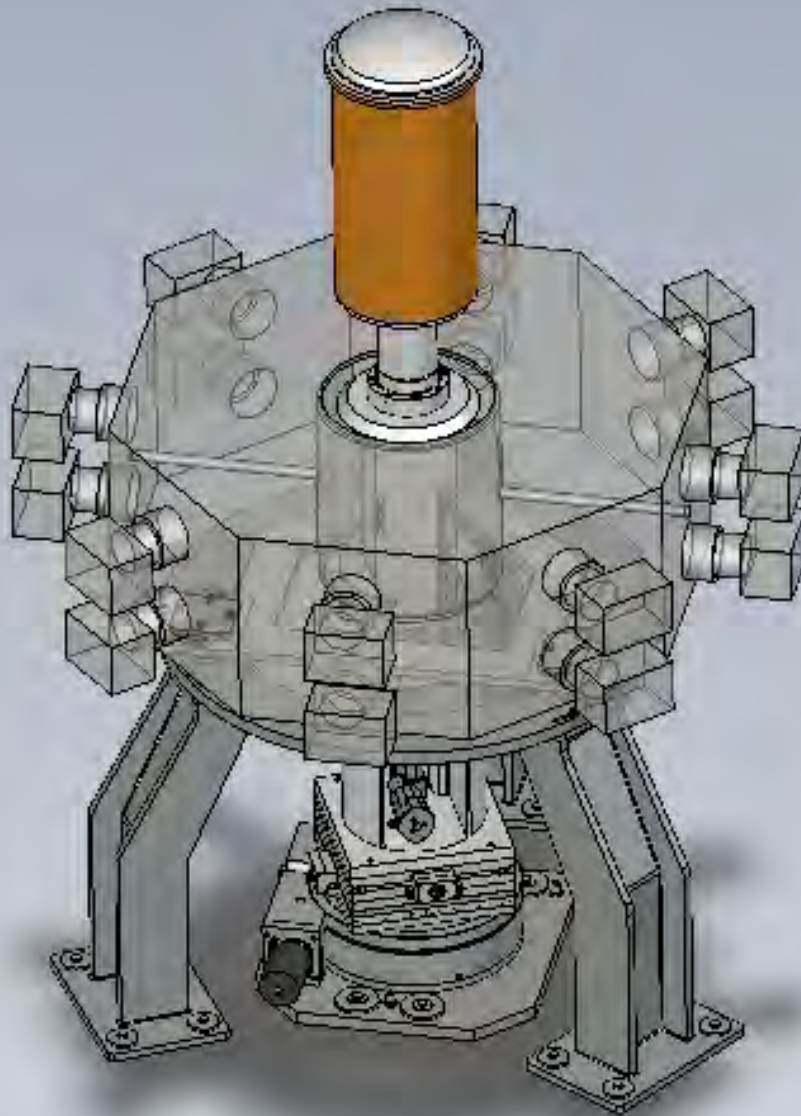
A.W.Hewat, B.Ouladdiaf, G.J.McIntyre, M-H.Lemee-Cailleau, D.Brau, S.York (2006)
ICNS Sydney, Physica. B (Condensed Matter) 385-86, 979-984





"4 π " Real-Time CCD Detector 2008

Cylindrical **C**CD **L**aue **O**ptics **P**hoto **S**cintillator



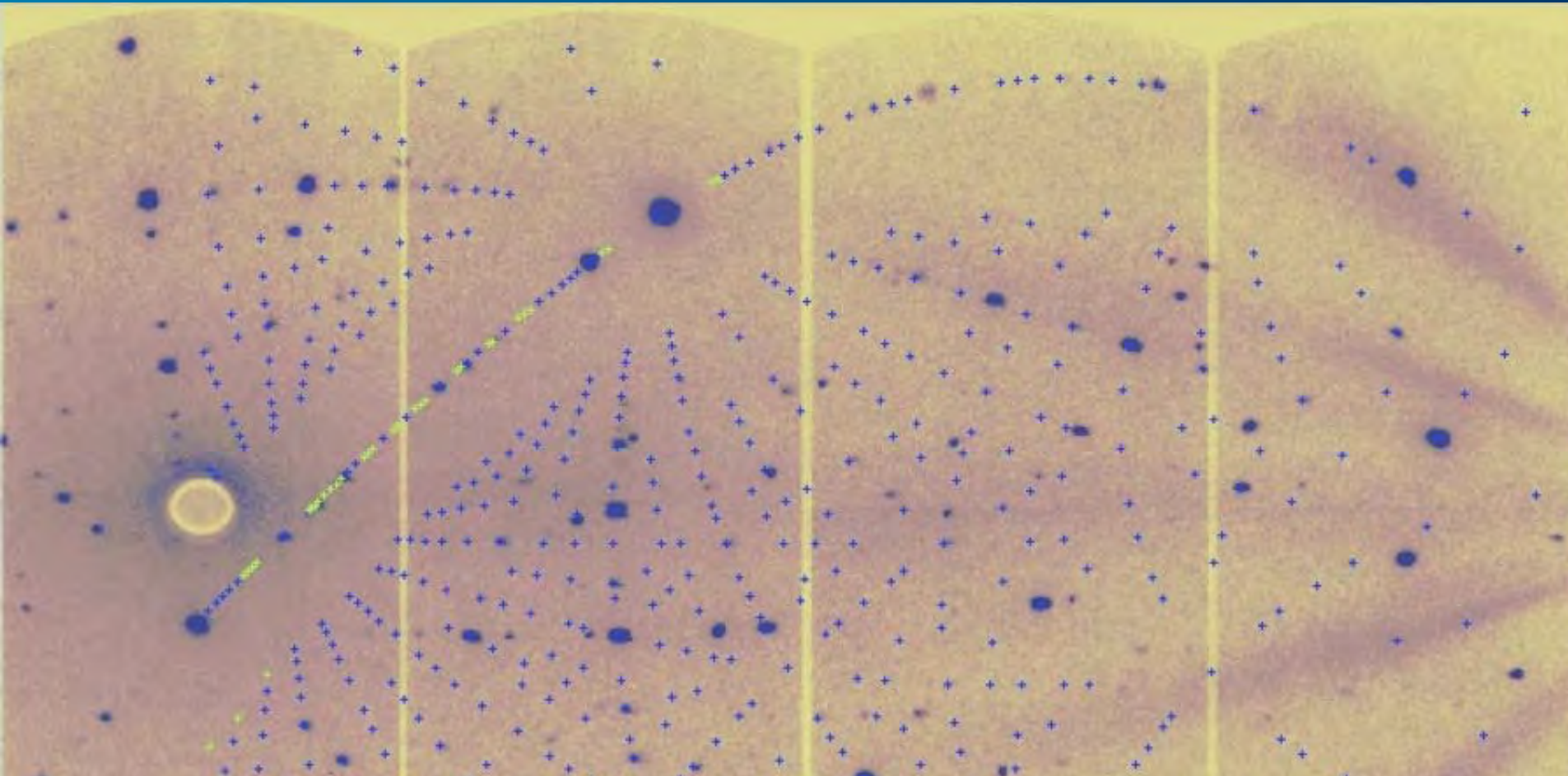
Photonic
Science





" 4π " Real-Time CCD Detector 2009

CYlindrical C CD Laue O Optics P Photo S Scintillator

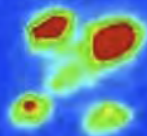
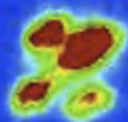
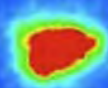


T=450K

T=435K

T=428K

T=400K



Split reflection [0-2 0] of CuSb_2O_6 with lower temp. associated with phase T/N



"4 π " Real-Time CCD Detector 2009

CYlindrical CCD Laue Optics Photo Scintillator



CYCLOPS has been constructed by Photonic Science
Operational at ILL at the end of 2008

APPLICATIONS

- Real-time magnetic & structure transitions
- Photo-induced transitions
- Stroboscopic crystallography
- Modulated and incommensurable phases
- Very small single crystals
- High pressure crystallography



" 4π " Real-Time CCD Detector 2009

CYlindrical CCD Laue Optics Photo Scintillator



CYCLOPS, a 4π CCD Laue Camera

