

# Experience of Industry/Academia Collaborations

FMB Oxford Ltd

Nigel Boulding – Managing Director

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- Equipment stability and resolution requirements can be extremely challenging

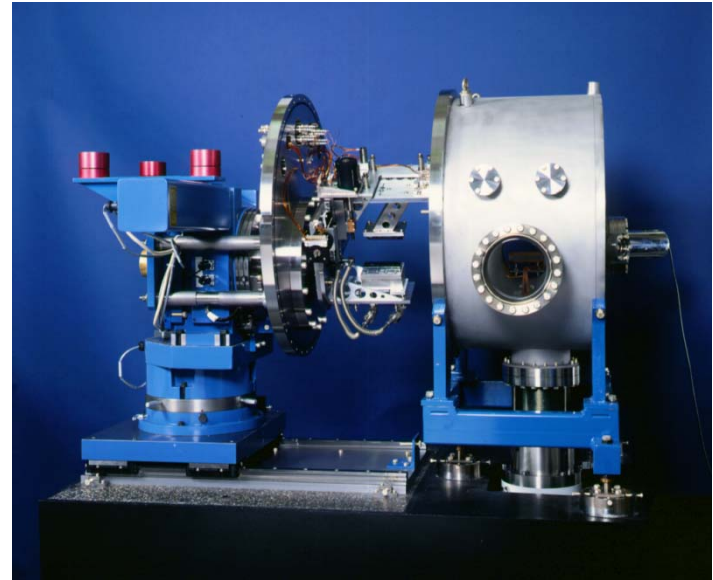
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- Therefore demonstrating performance can be expensive and can often only be done at a research facility
- Licensing proven technology and/or working with academia to develop and prove new technology can be essential

**1994-2001**

Manufactured to a design  
licensed directly from SNBL



**1998-2002**

Purchased a goniometer manufactured  
by Vacuum Generators to a design  
licensed from the (then) CLRC



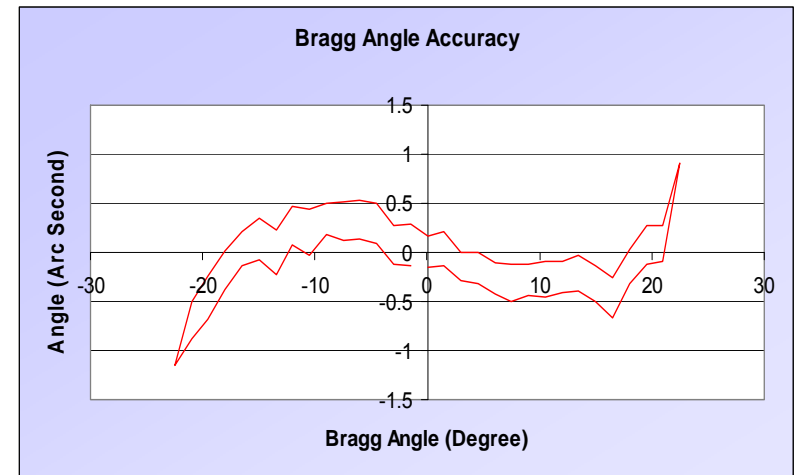
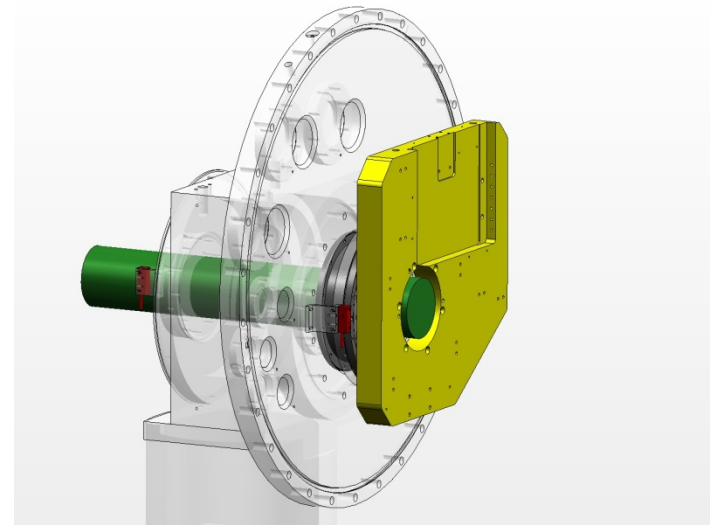
## Older style DCM

- Worm and wheel drive mechanism
- External (out of vacuum encoding)

### **Output** compared to **Requested**

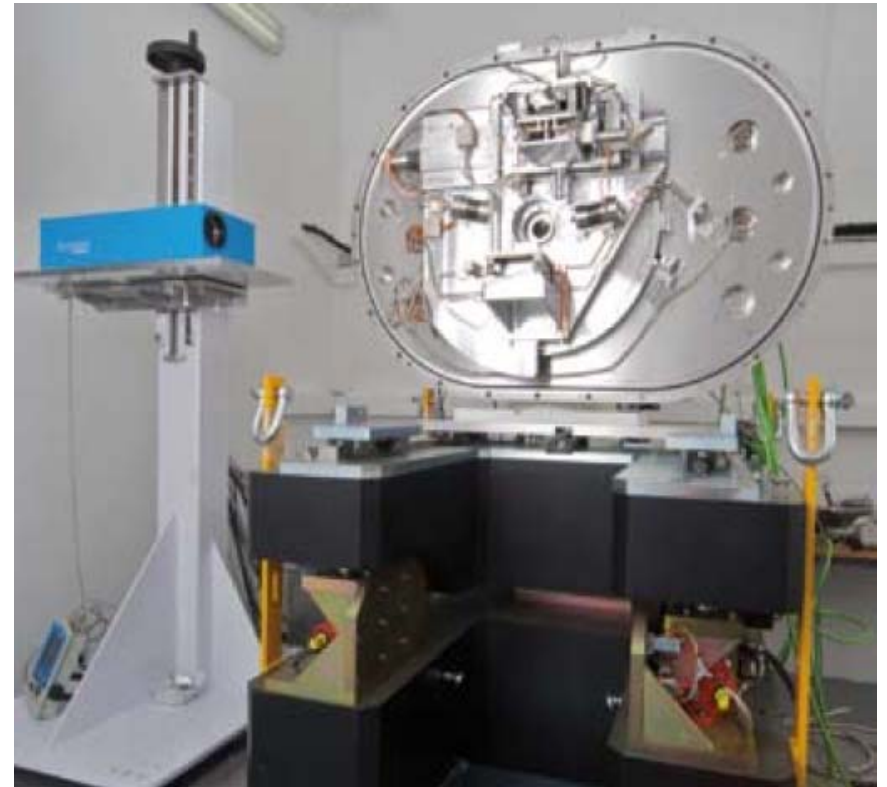
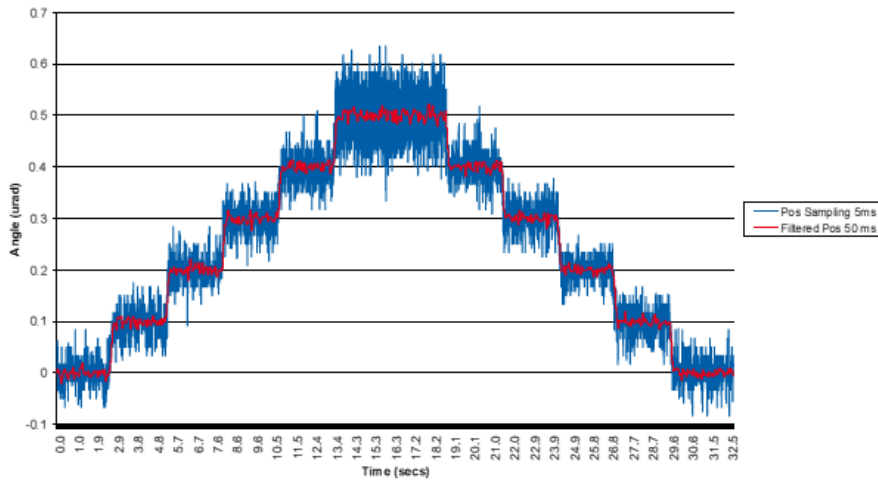
- ‘Wind up’ in shaft due to eccentric load
- ‘Stiction’ due to vacuum seal around shaft

.....but generally performance was repeatable and therefore manageable



$$1 \text{ arcsec} = 4.8 \mu\text{rad}$$

# New 'Direct Drive' DCM

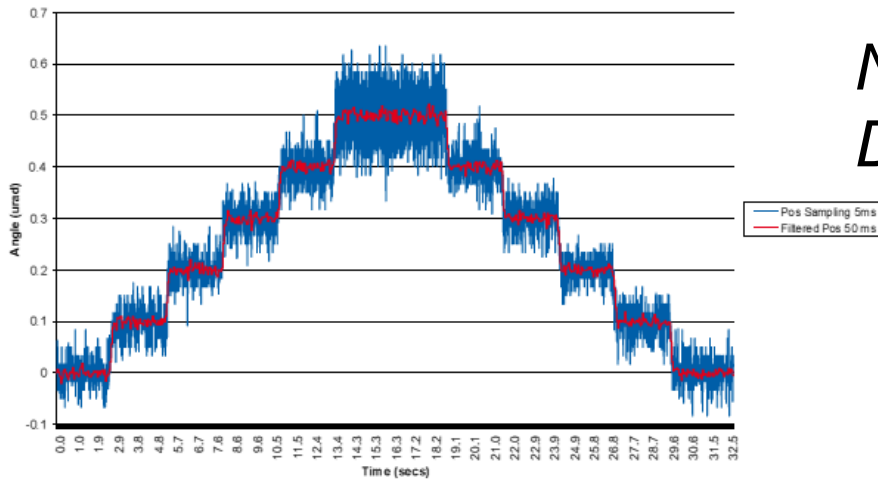


6<sup>th</sup> October 2010

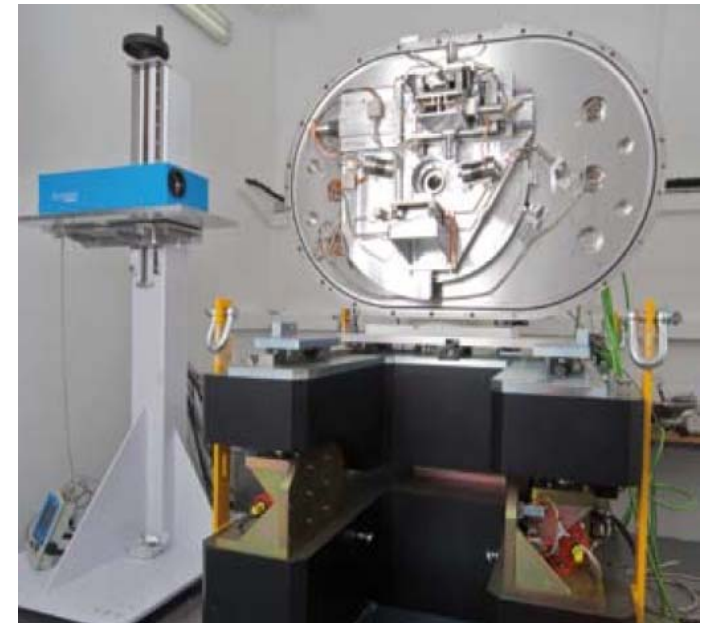
John Adams Institute  
Accelerator Technology Workshop

FMB Oxford

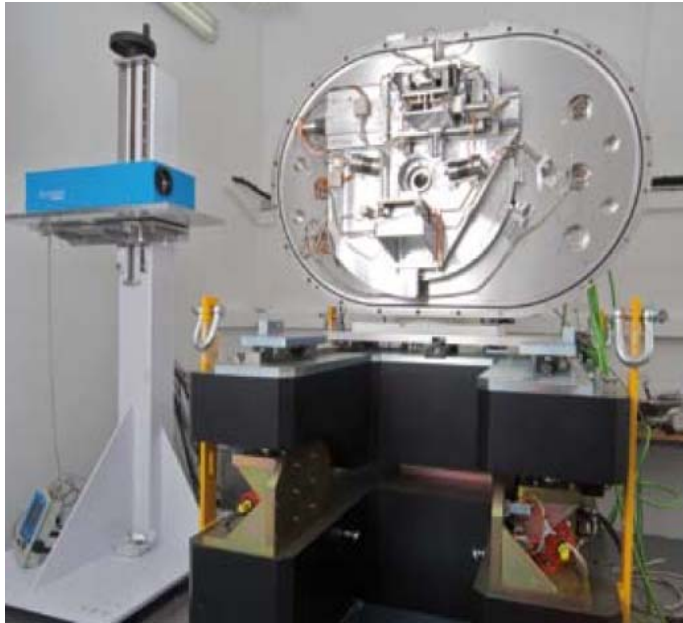
# New 'Direct Drive' DCM



How far away does a 5p piece need to be for an included angle of  $0.1 \mu\text{rad}$ ?

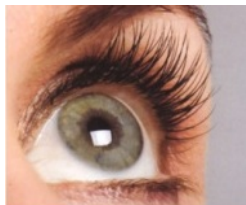


# 'Direct Drive' DCM



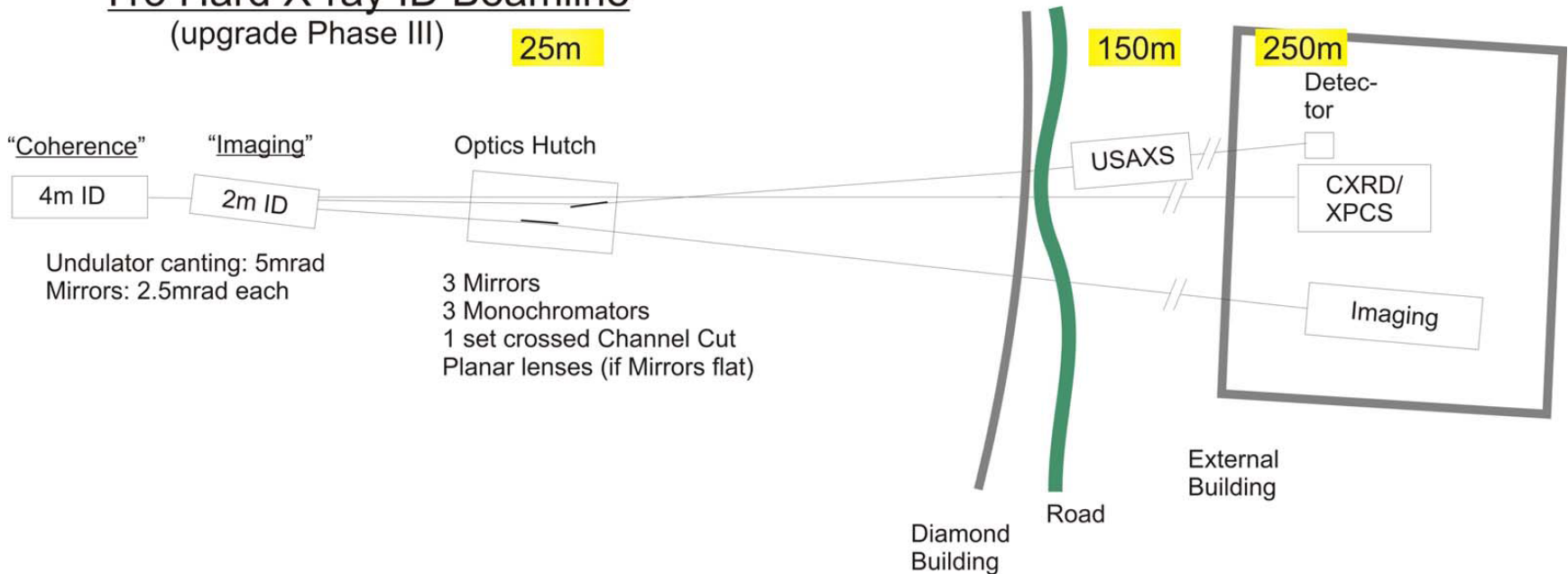
How far away does a 5p piece need to be for an included angle of  $0.1 \mu\text{rad}$ ?

180 km – about the same distance as from Oxford to Manchester



# Longer X-ray Beamlines

## I13 Hard X-ray ID Beamline (upgrade Phase III) 25m

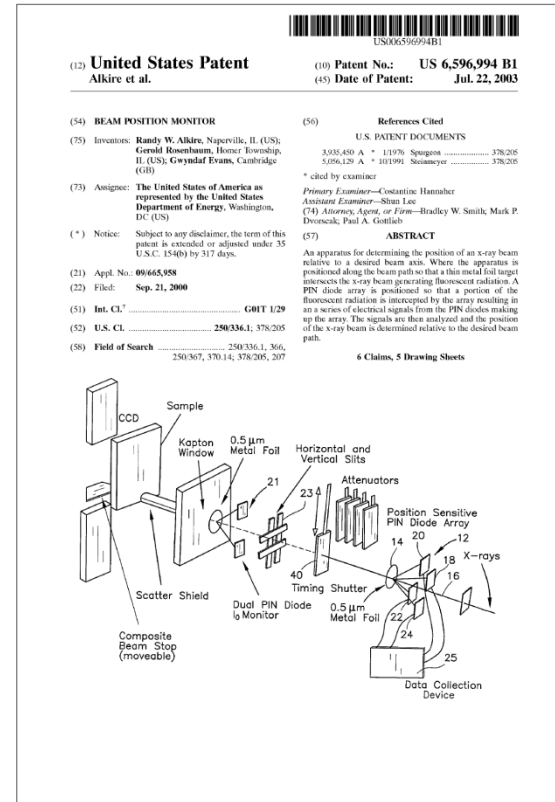
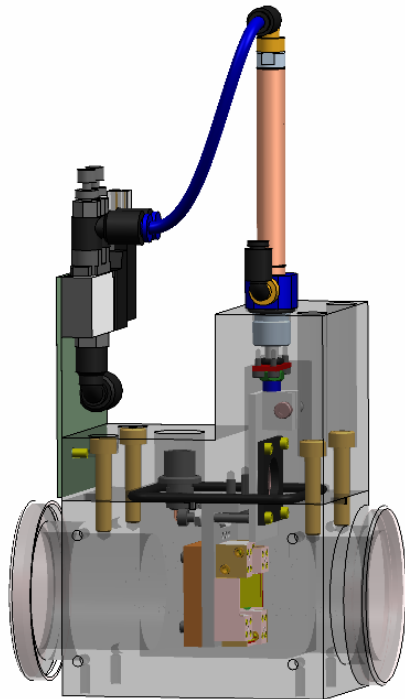


0.1 $\mu$ rad at 200m is 20 $\mu$ m displacement

# Measuring the position of the beam

## Quadrant Beam Position Monitor (QBPM)

High vacuum end-station device capable of position resolution of 1-2 $\mu$ m

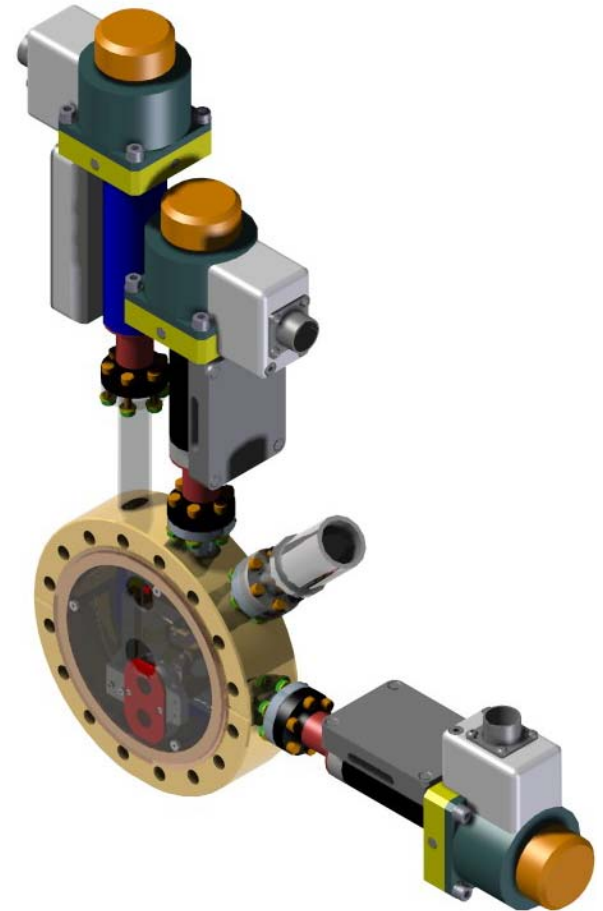


Licensed in 2003 from US DOE (ANL/APS)

Co-inventors Randy Alkire, Gerold Rosenbaum and Gwyndaf Evans

## *The FMB Oxford UHV QBPM*

- This device can be used anywhere along the beamline with monochromatic beam
- We have also developed a 'wide' QBPM for use with bend magnet radiation
- This is still based on the same principle of operation and attracts licence fees for the DOE (ANL) just as does the HV QBPM



**A total of 121 sold since 2004 – 78 UHV and 43 HV**

- A new patented BPM developed by Roelof van Silfhout
- Exclusive licence agreement
- CASE student starting on new developments this year

