Diamond Status
October 2004

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(plus many others)

Overview

- What is Diamond?
- Progress on the machine
- Examples of EPICS development
- Progress on beamlines

A reminder – what is Diamond?

- 3rd generation, 3GeV synchrotron light source
- Currently being constructed in the UK.
- Storage ring is a 24-cell double bend achromatic lattice of 561m circumference.
- Extremely low emittance – 2.7 nm-rad, so very bright source.
- 100 MeV LINAC and full energy booster synchrotron for injection.
- 8 beamlines completed by early 2007
- 14 more beamlines by end 2011
- First users Jan 2007

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A reminder – what is Diamond?

Synchrotron facility	Experimental period:	Electron Energy (GeV)	Horizontal Emittance (nm-rad)
LURE - DCI	1974 -2003	1.85	1600
LURE - SuperACO	1987 -2003	0.8	38
SRS	1981 - 2008	2.0	150
ELETTRA	1994 -	2.4	9.7
ESRF	1994 -	6.0	4
BESSY-II	1998-	1.7	6.0
MAX-II	1997-	1.5	8.8
SLS	2002-	2.4	5.0
Soleil	2006-	2.75	3.7
Diamond	2007-	3.0	2.7

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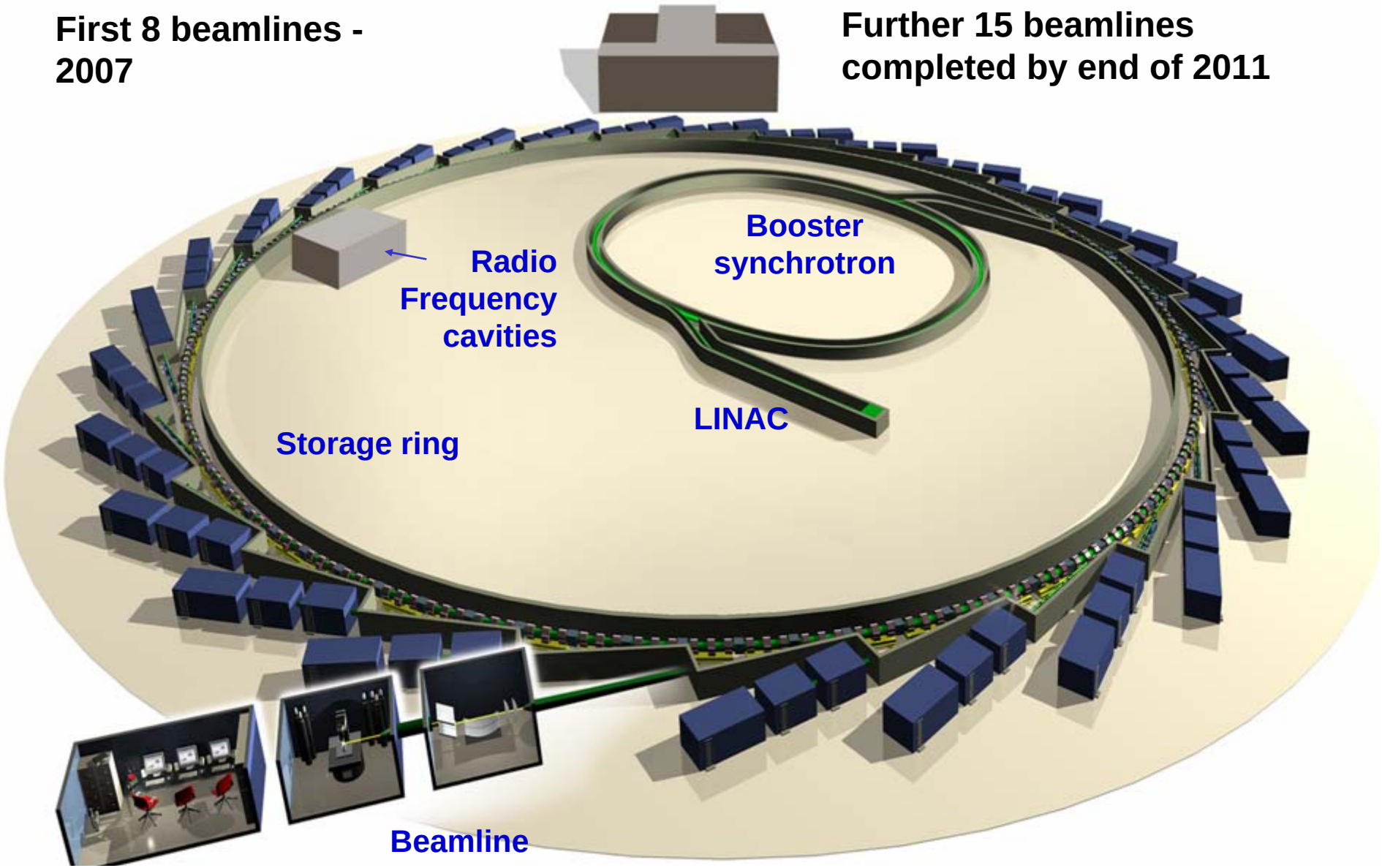
A reminder – what is Diamond?

First 8 beamlines - 2007

Further 15 beamlines completed by end of 2011



Progress

- Moved into office building January 2004
- LINAC installed, commissioning started in August
- 50% of the Booster magnet and vacuum girders are installed, together with Cavities, RF amplifier and all instrumentation.
- 33% of SR magnet and vacuum girders are installed together with one SC RF cavity, refrigeration plant and three RF amplifiers.
- Problems with prototype ID's, but these seem largely overcome and orders placed for first 9.
- First 8 beamline hutches installed and being finished.

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Progress

- A number of problems
  - Building late
  - Problems with supply (magnets, vacuum components - well, just about everything at times).
- A number of slips of about 6 months in some areas
- A formal slip of about 2 months on first turn.
- Still intending to be ready for first science in early 2007, but some modes on some beamlines will probably not be available.
- In the past we have thought of the schedule as aggressive – now its so aggressive it might need a restraining order…

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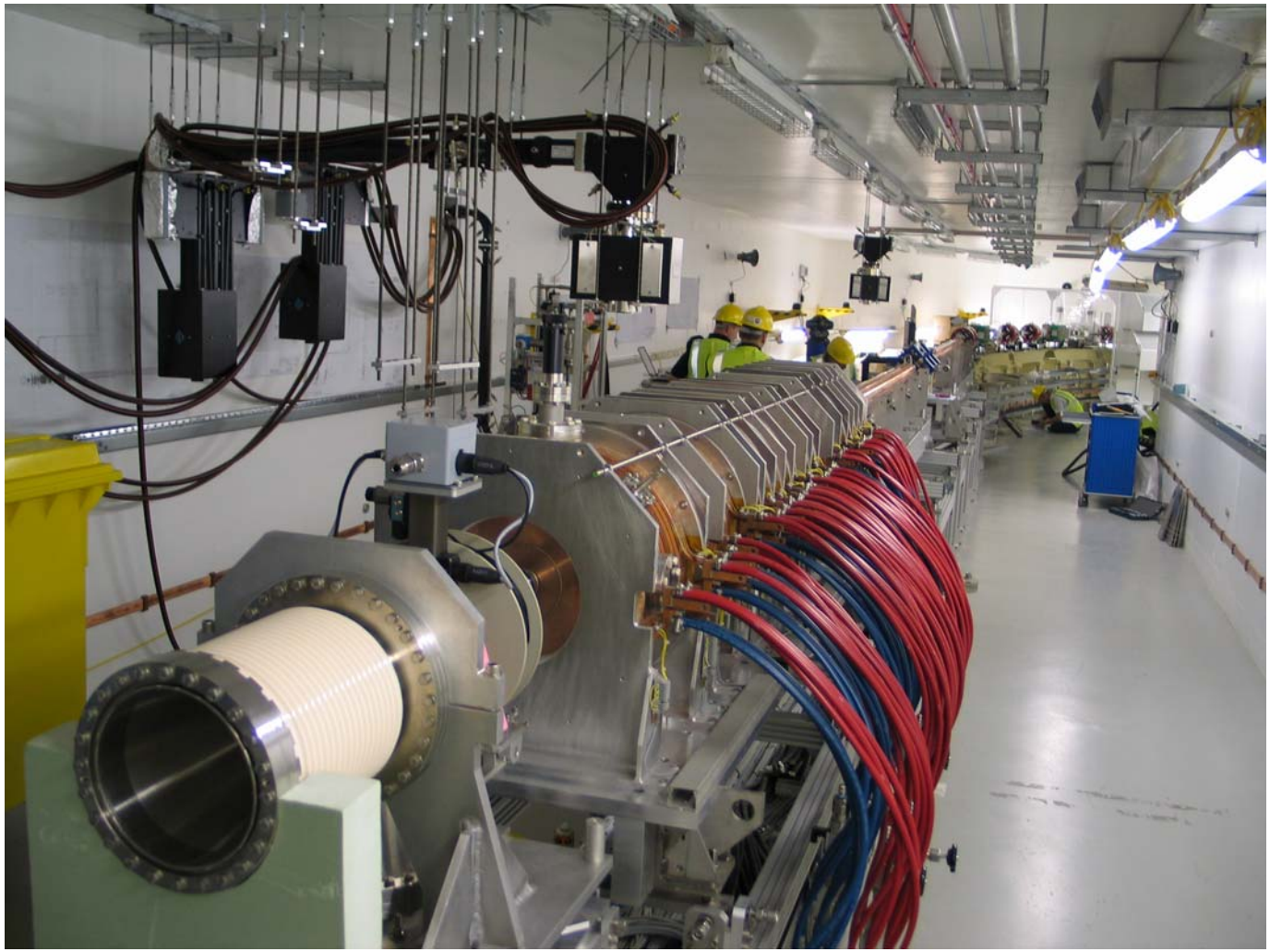
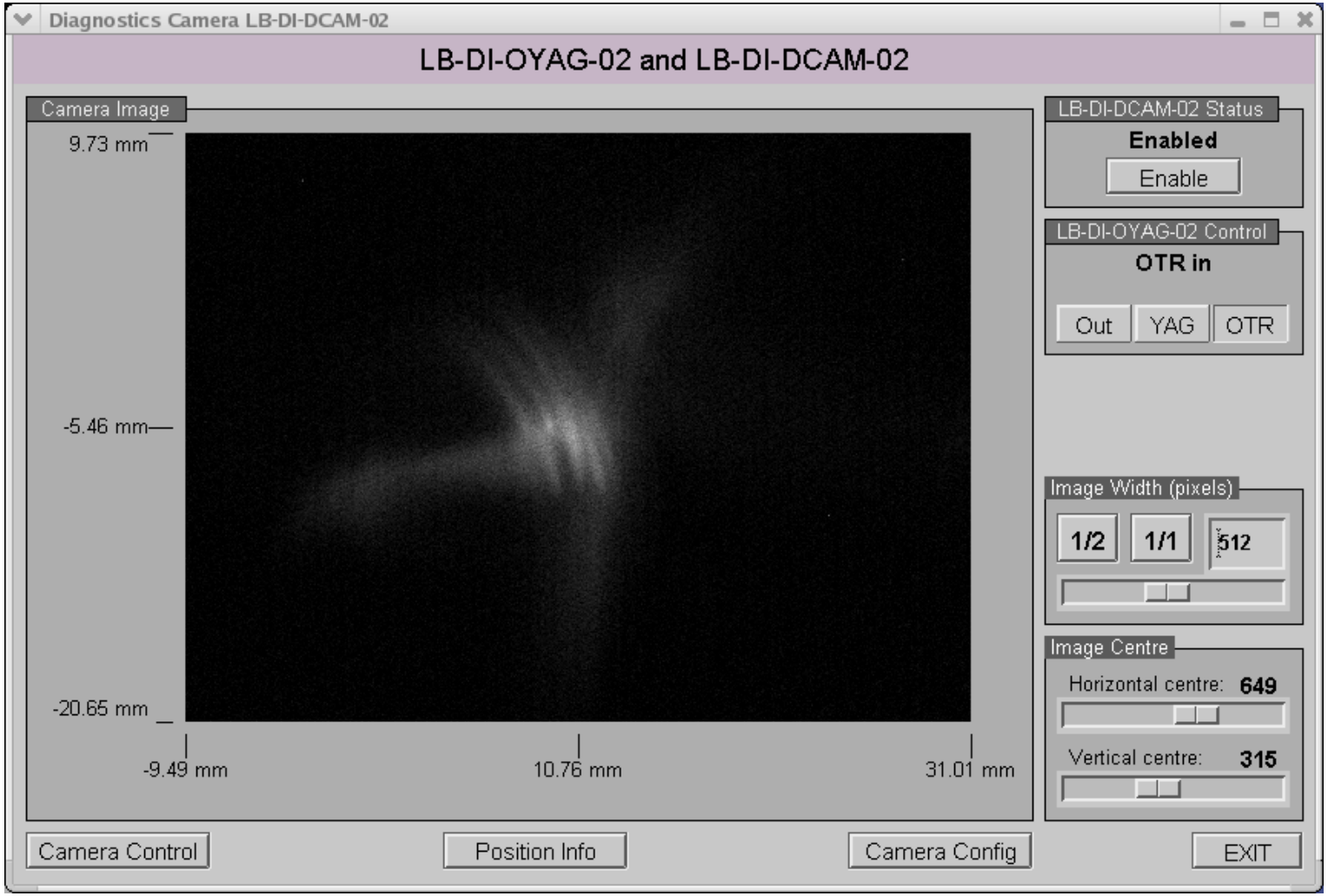
LINAC Commissioning

- **Started in August and early Sept**
- **Including in commissioning:**
  - **VME IOCs for the RF modulators, diagnostics, PSUs, vacuum, PSS and timing,**
  - **Six Libera eBPMs.**
- **Achieved 100 MeV with approx 1 nC on 8 September**

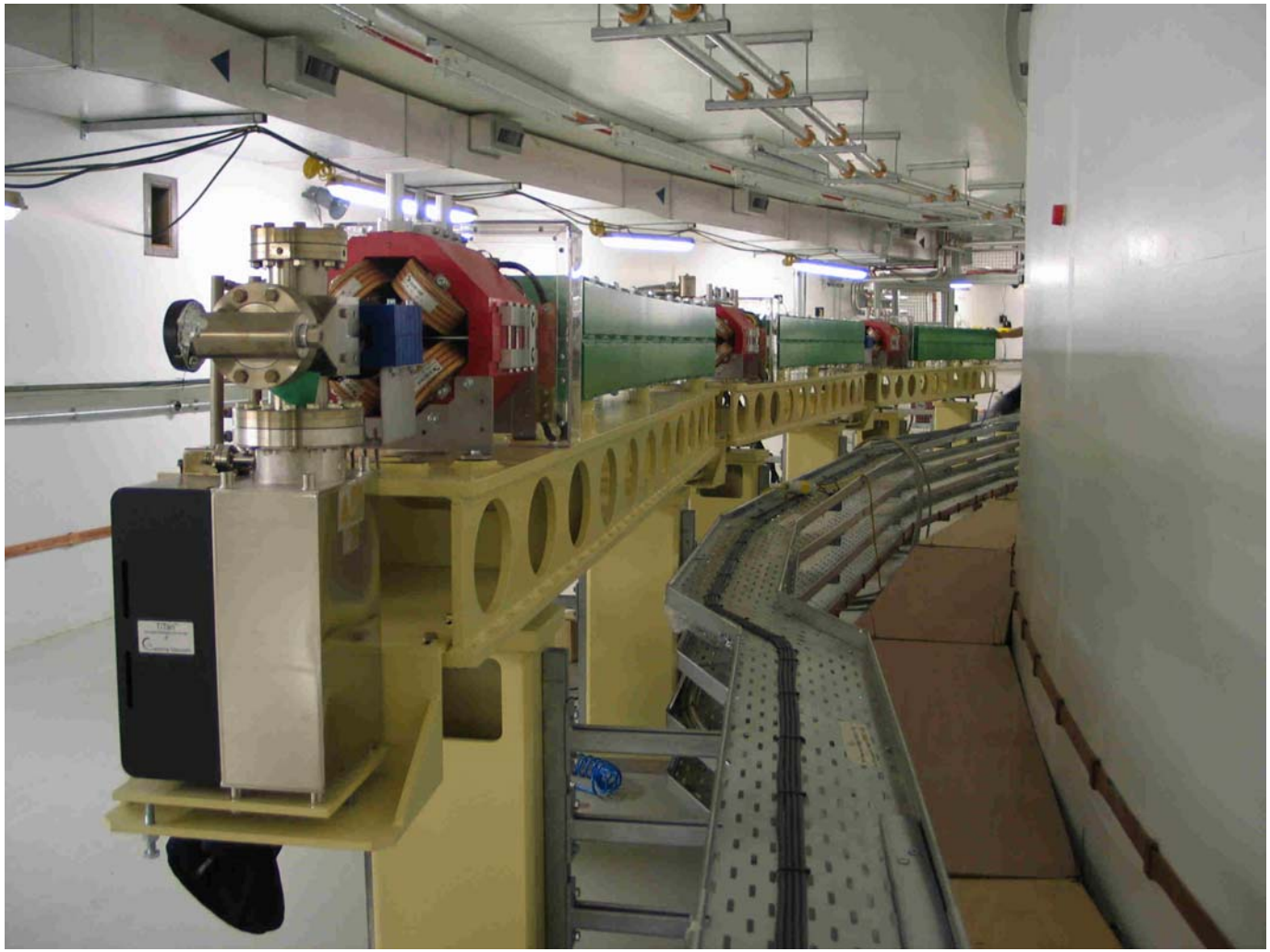
LINAC Commissioning



LINAC Commissioning



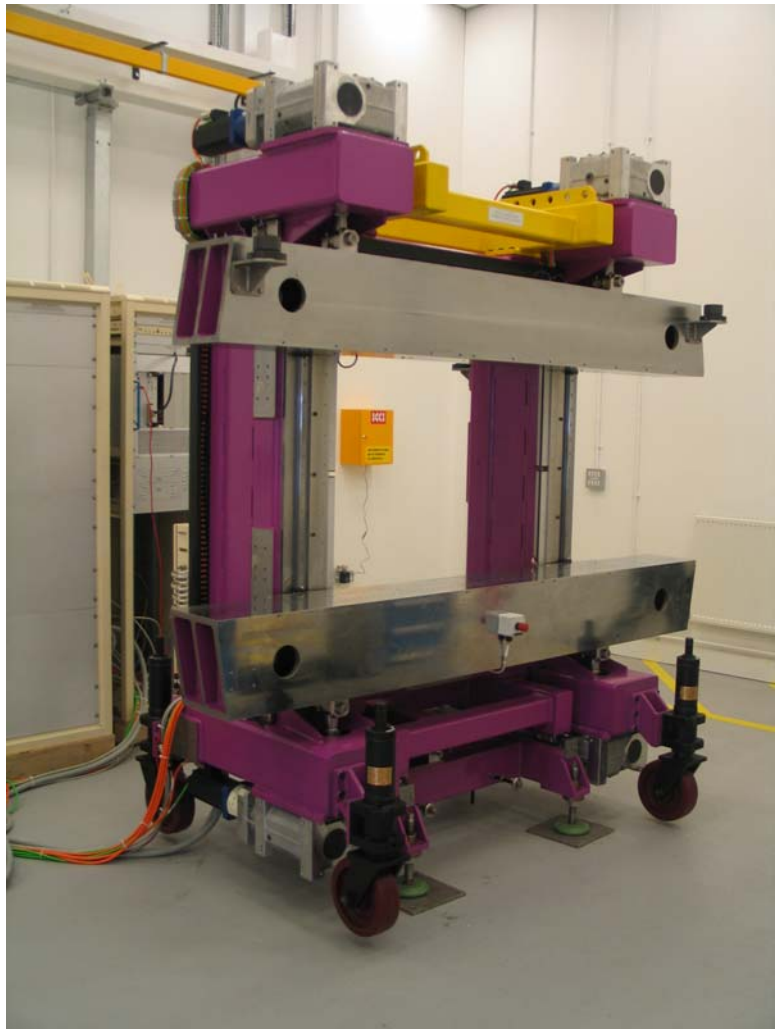
Booster construction



Storage Ring Construction

Insertion devices

- First two prototypes built to Diamond design by Michromech
- 2 HU64's, 2 U21's, 1 U23, 1 U25, 2 27's and 3.5 T SCMPW.
- OMS58 controller, DC servos.
- PLC 'in loop' doing encoder format translation and equipment protection
- EPICS by Observatory Sciences under subcontract to Micromech
- Some mechanical problems with helical undulator



Diagnostics

- **Libera eBPM beam position measurement.**
  - **ARM processor running Linux and EPICS R3.14.**
- **Point Grey Research "Flea" CCD cameras with the IEEE1394 Firewire bus with Steve Hunt's EPICS support for both Linux and VxWorks.**

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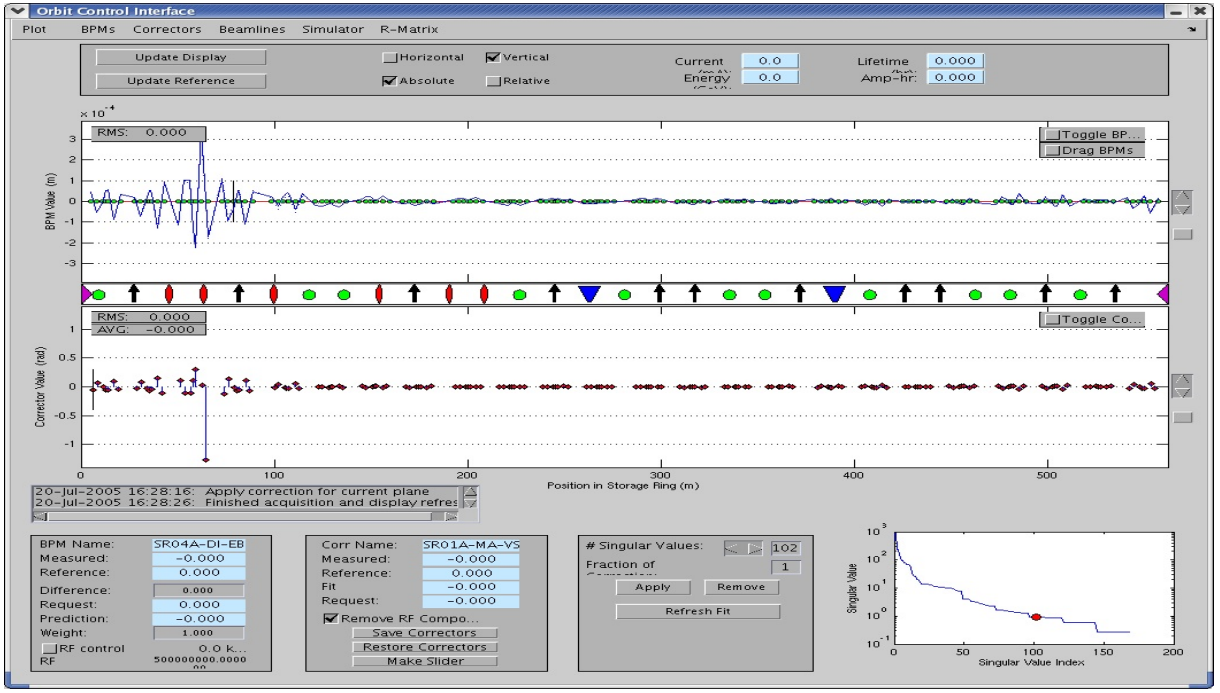
Virtual Accelerator

- **Simulation of a linear lattice though the intended PV interface.**
- **Developed EPICS device support to TRACY-2 libraries which are used to implement the model.**
- **Using the Matlab Toolkit for physics tools.**



Other developments

- Timing – using a development of the SLS system
  - Others here know far more about it than me!
- PSS – wired, manual search based system
  - Development of the SRS ideas
- Power supplies – development of SLS system
- Machine protection
  - Omron PLC based ladder logic system
- Vacuum
  - serial based RGA, Pirani and Cold Cathode gauge controllers, plus discrete logic controlled valves
- Source code control
  - Started using Subversion, with good results, but it is a bit different from CVS.

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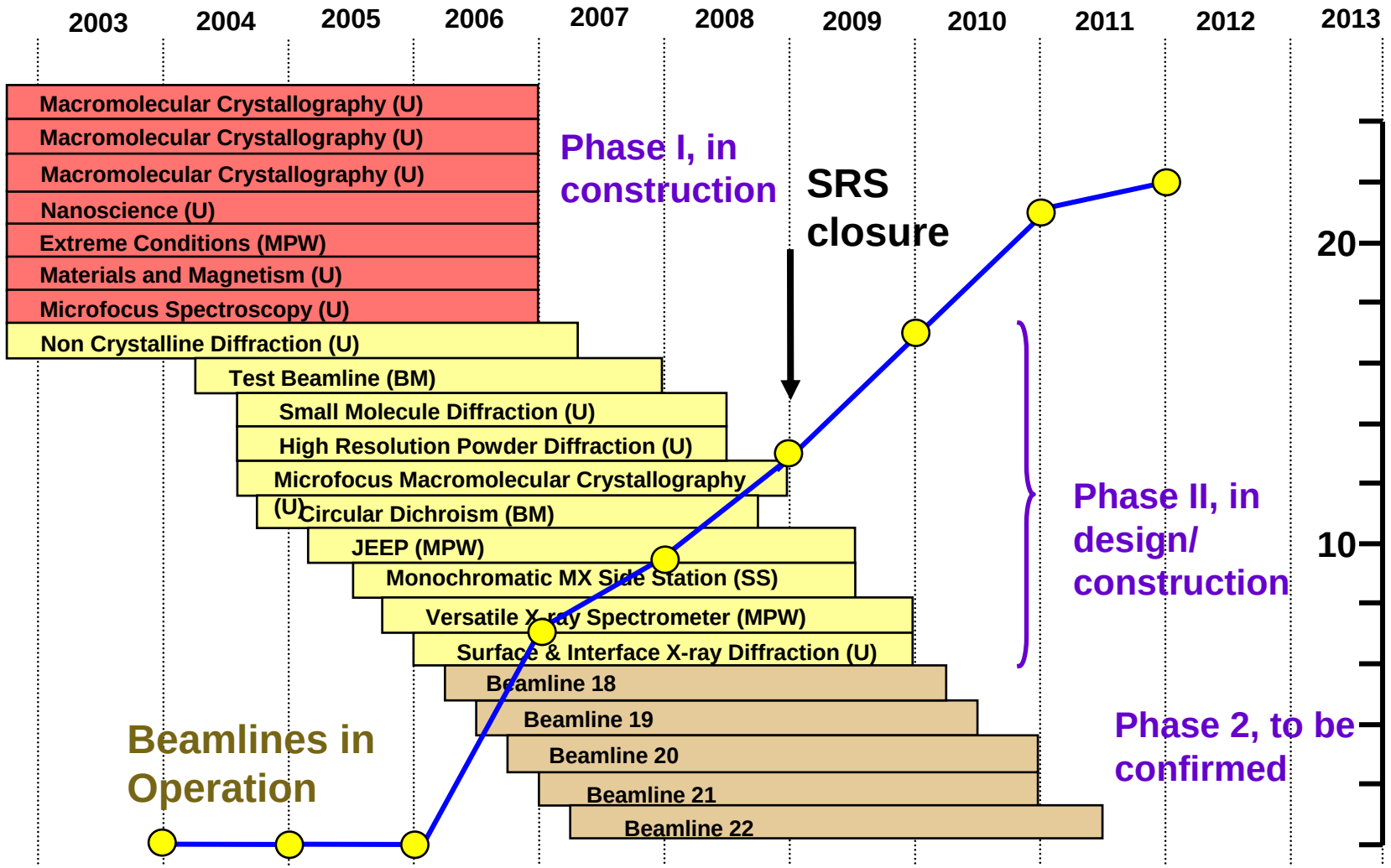
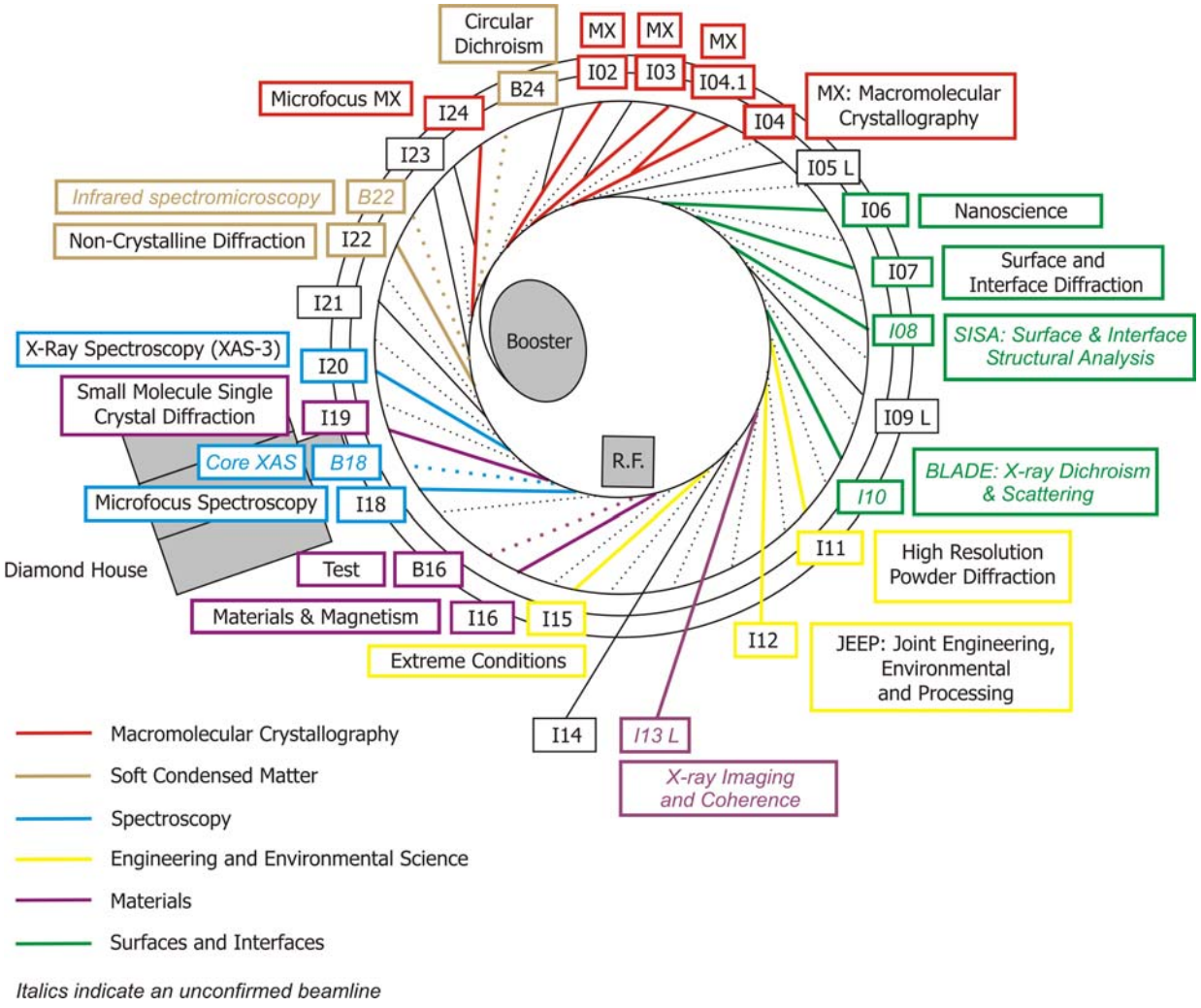
Beamline Programme



22 in total

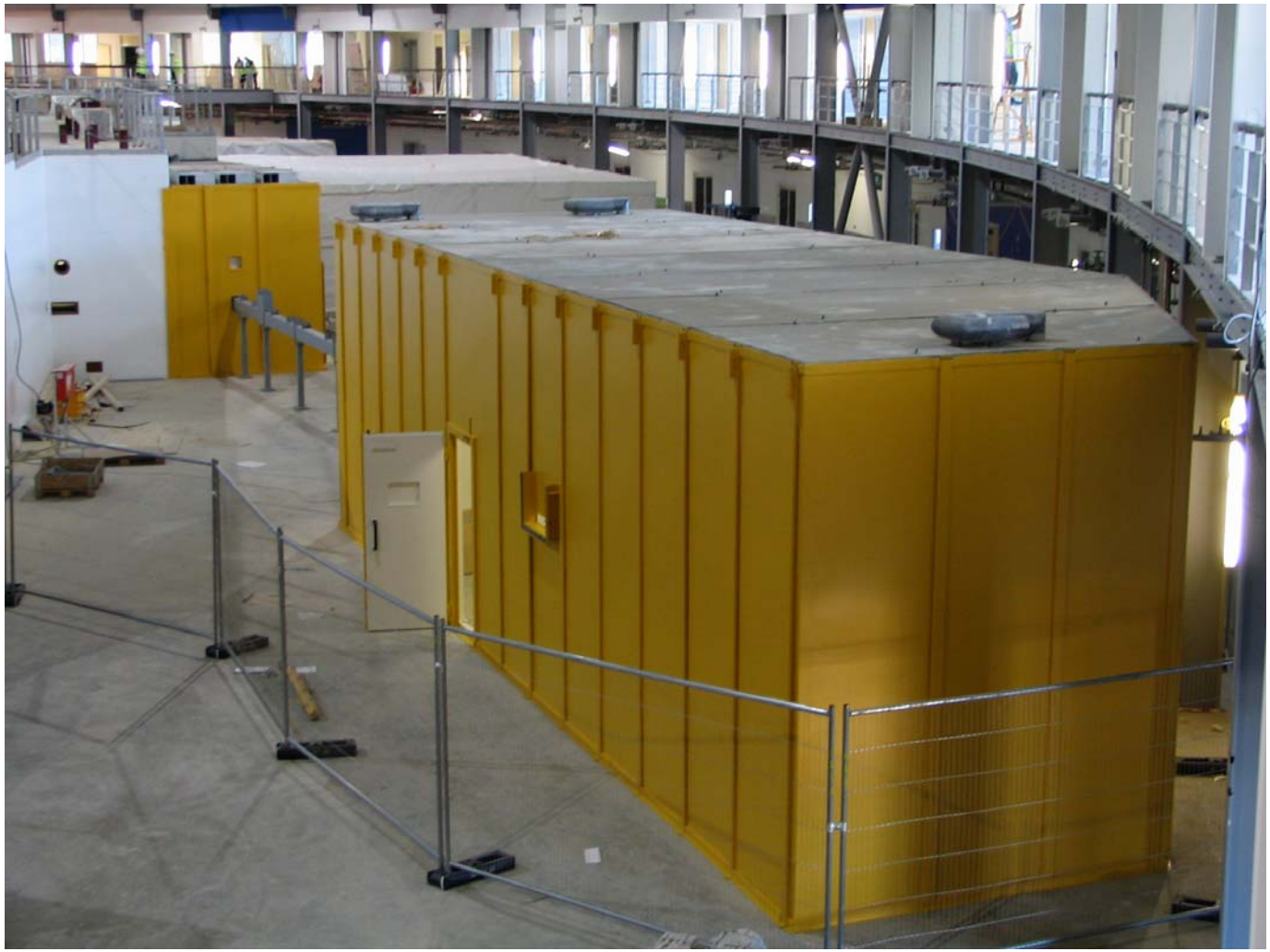
Beamline “Villages”



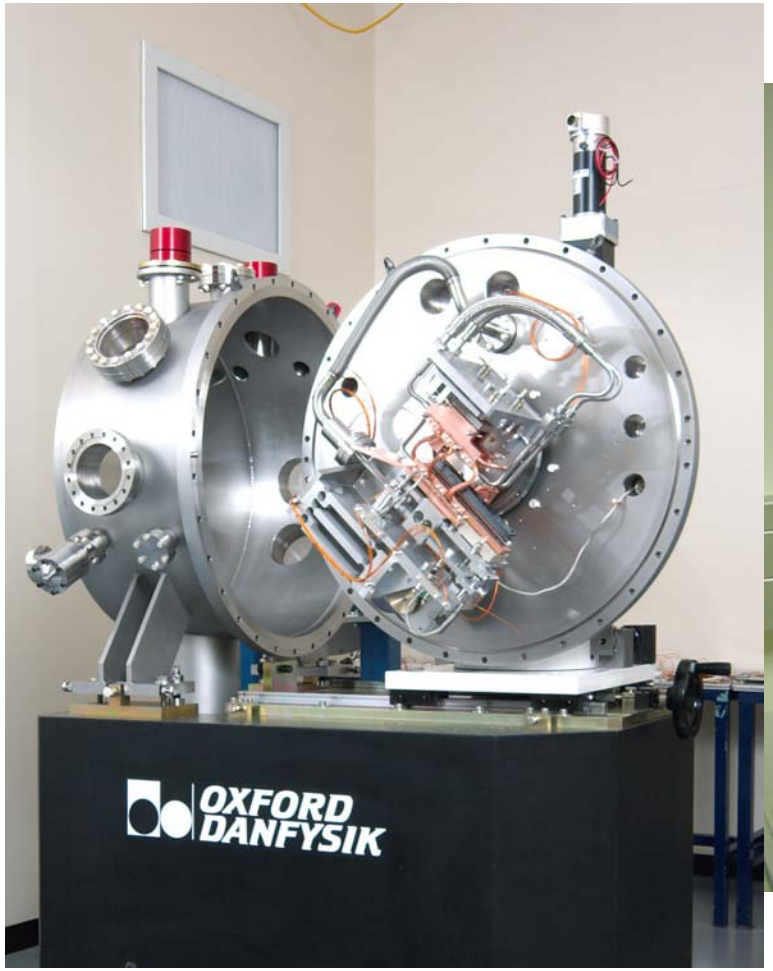
Beamline Progress

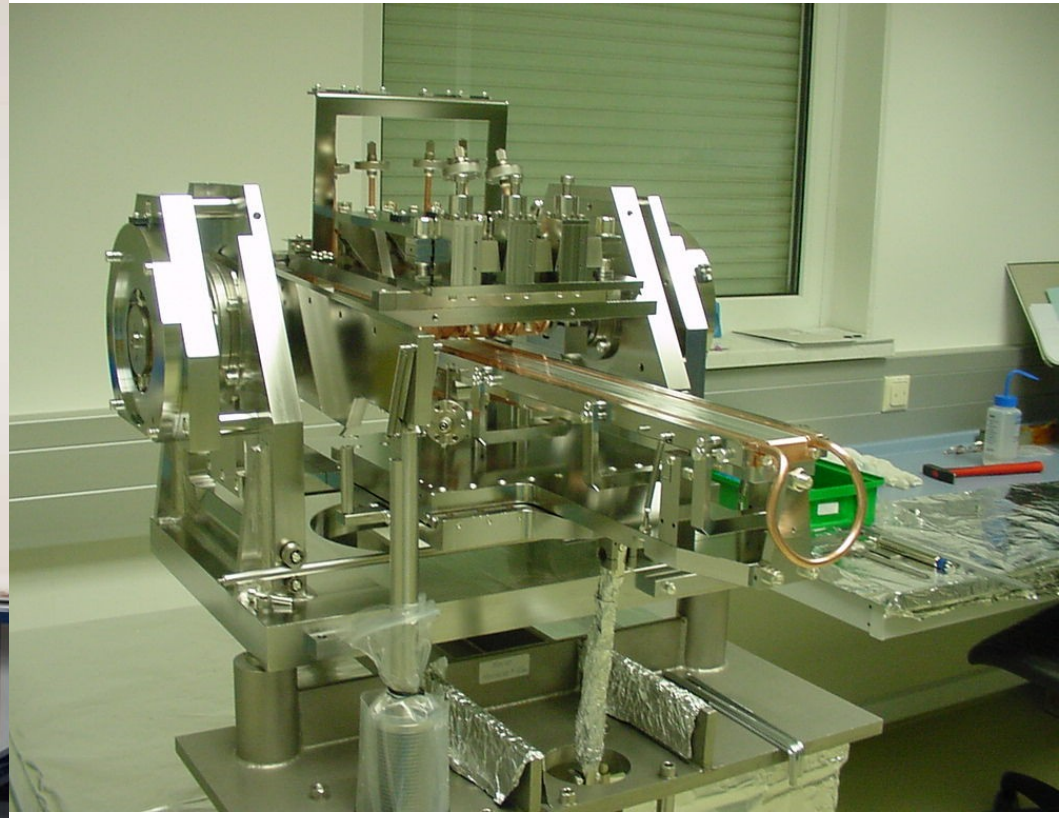
- First 8 hutches and most cabins installed
- Some hardware available – a lot arriving in the next six months.
- Beamline simulations being developed.
  - Using driver level Delta Tau simulator for motrion
  - Using Machine vacuum simulations
  - Aiming to deliver in the next month
- Integration and test first half 2007
- Commissioning 2nd half 2007

Beamline progress - Hutches



Beamline Progress - monochrometers





Conclusions

- Diamond will be a high brightness, 3rd generation light source for the UK community
- It is currently in an aggressive construction phase but
- Controls work is largely going to schedule
- A reasonable amount of new EPICS development and evolution.
- 8 beamlines available in early 2007