Status of the Diamond Project

By James O’Hea, Software Systems Engineer

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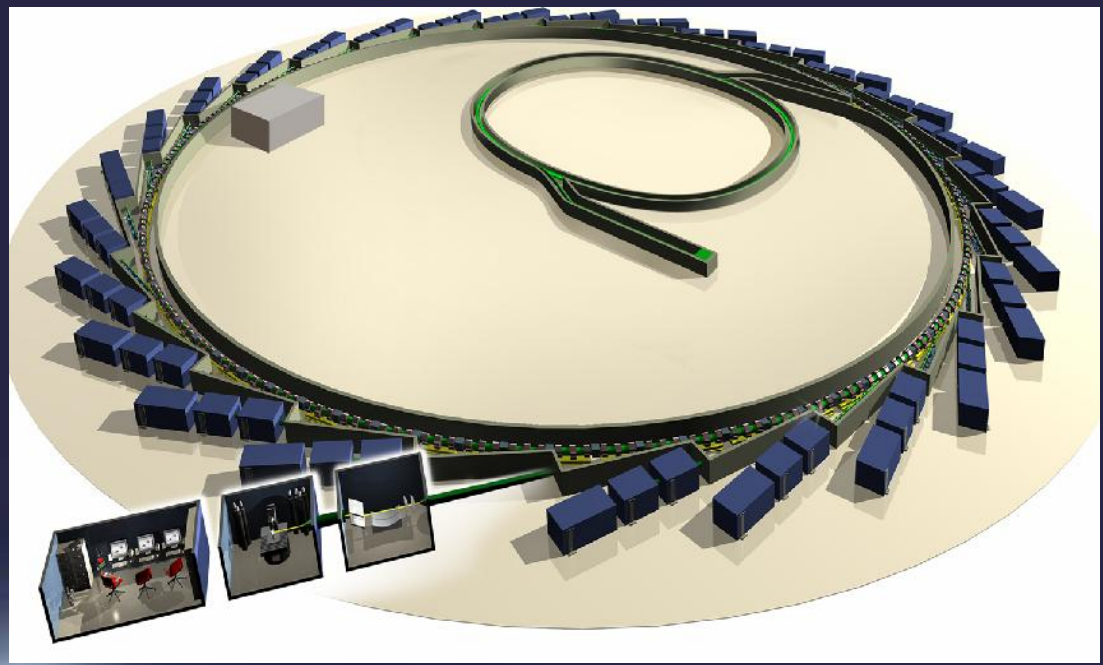
Introduction to the Project

- Diamond is a is a 3rd generation, 3GeV synchrotron light source
- It uses a full energy booster synchrotron and Linac for injection.



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Construction

Site construction began October 2003, and has included,

- 2 million man hours
- 2,100 tons of steel
- 35,000m^3 of concrete
- 33000m^2 of roofing
- A site the size of 5 football pitches

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Construction Progress

- Foundations laid through September 2003
- Roof Cladding laid May 2004
- The main external and internal structure completed October 2004
- Construction efforts then turned towards developing experimental hall
- Construction complete May 2006

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Phase I Beamlines

- Phase I included the first 7 beamlines
  - Extreme Conditions
  - Materials & Magnetism
  - Microfocus Spectroscopy
  - Nanoscience
  - 3 x Macromolecular Crystallography

Phase II will include an additional 15 beamlines

A further 4 to 5 will become available each year until 2011

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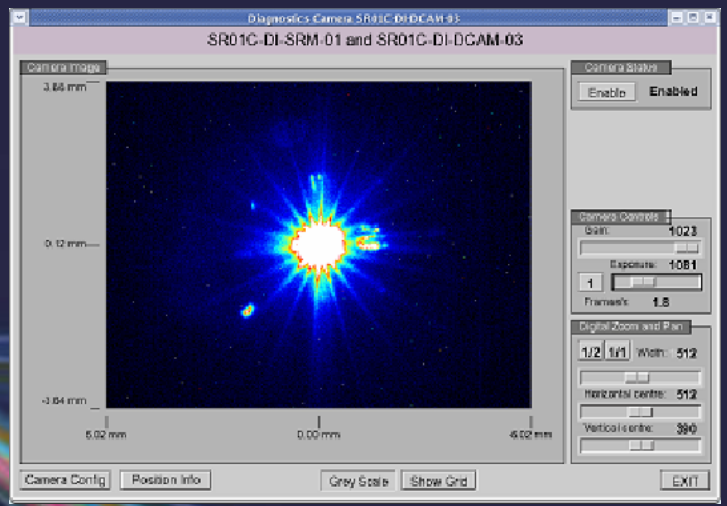
Milestones of 2006

- Last year saw many milestones
  - First Light achieved in the storage ring
  - Reached 3GeV
  - First Light taken to the beamlines in the Autumn
  - First users welcomed during February this year from Oxford, Durham, Leicester, and London
  - Will allow experience to be gained and optimisation to take place



Materials & Magnetism

- Using x-rays to examine new types of magnetic read-head sensor, constructed from minute films of magnetic materials
- The beam can allow better understanding of the material properties
- The better the structural design, the better the product quality

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Macromolecular Crystallography

- Gain better understanding of the structure of viruses, with the aim of being able to design more targeted and effective vaccines and treatments
- Also studying the structure of molecules from the human body. The biological function of molecules is dependant ion their shape and design

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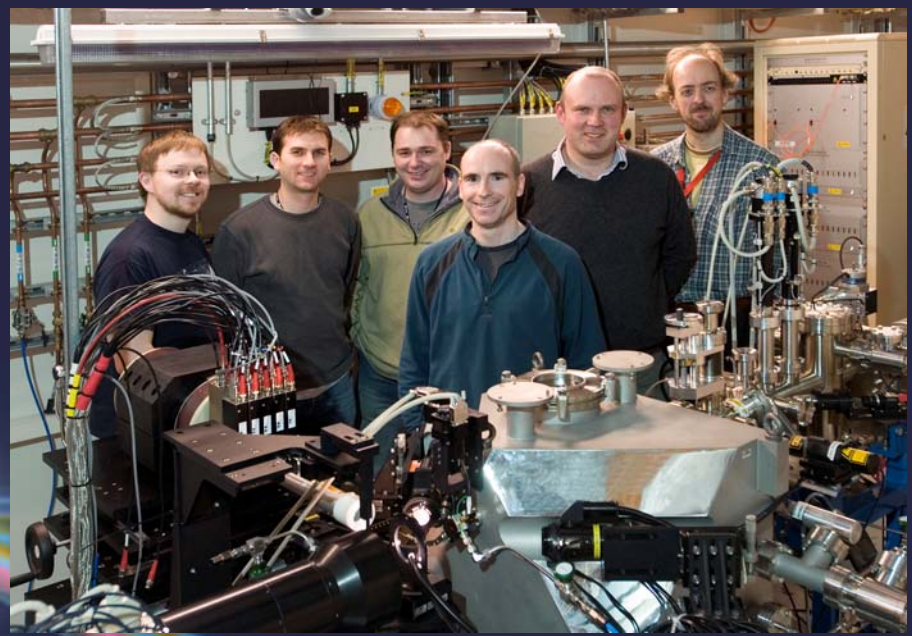
Microfocus Spectroscopy

- Using x-rays to study a range of earth and life science specimens from the Natural History Museum's collection
- Gain an insight into natural processes and environmental systems
- Currently studying samples from the Santa Catharina meteorite – gain better understanding of early solar system conditions



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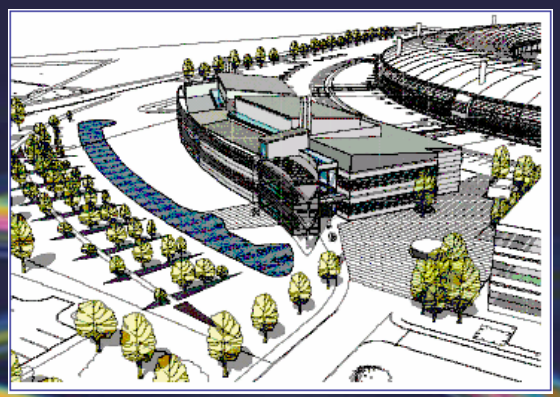
Future Building Projects

- Ridgeway Guesthouse
  - On-site accommodation with 180 rooms
  - Dining facilities
- Research Complex
  - Multidiscipline – both life and physical sciences
  - Facility for users and beamline scientists
  - Scientists supported by long and short term appointments
- Computing Centre



Control Systems Architecture

- Based on EPICs (3.14.8.2 on beamlines)
- Primary interface to Control systems through VME IOCs
- Use VME64x, with VxWorks, IP carriers, IP Modules and transition board for rear connection
- PLCs to manage interlocks for protection
- Allow warm reboot of IOCs and hot swap capability
- Serial Interface to Instrumentation with serial support through Stream Device
- VME for embedded systems
- Siemens PLCs for processed control applications
- Omron CJ1 for interlocks / protection systems
- Red Hat 9 Linux for development

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Beamline XML Signal List

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	#GUI-MO		FORMAT	COLOURS:	<CC	<CC	<EN	FILI	NAI	DEF	EDI	#	PREFIX	GV	VAC		
2	#Notes: The macro for an empty string is "" (two double quotes). No Commas in names																
3	NAME	DESCRIPTION	IOC	P	NM	NFL	NTE	NCU	NCA	NPI	NPO	M1	M2	M3	M4	M5	M6
4	EDM_MACROS:			P								M1	M2	M3	M4	M5	M6
5	DEFA	LTS															
6	GV0	Front End Valve	BL18I-VA-IOC-01	FE18I-VA-VALVE-02	0	0	0	0	0	1	0						
7	SHTR1	Front End Shutter	BL18I-MO-IOC-01	FE18I-PS-SHTR-02	0	0	0	0	0	1	0						
8	GBC1	Gas Brem Coll 1	BL18I-MO-IOC-01	BL18I-RS-ABSB-01	0	0	0	0	0	0	0						
9	D1	Diagnostic 1	BL18I-MO-IOC-01	BL18I-DI-PHDGN-01	1	1	0	1	1	0	1	:POSN					
10	S1	1st (Aperture) Slits	BL18I-MO-IOC-01	BL18I-AL-SLITS-01	4	2	8	0	0	0	0	:XA	:XB	:YA	:YB		
11	D2	Diagnostic 2	BL18I-MO-IOC-01	BL18I-DI-PHDGN-02	1	1	0	1	1	0	1	:POSN					
12	GV1	Gate Valve 1	BL18I-VA-IOC-01	BL18I-VA-VALVE-01	0	0	0	0	0	1	0						
13	HFM	Toroid Mirror	BL18I-MO-IOC-01	BL18I-OP-HFM-01	8	3	4	0	0	0	0	:Y1	:Y2	:Y3	:X1	:X2	:BEND1
14	GV2	Gate Valve 2	BL18I-VA-IOC-01	BL18I-VA-VALVE-02	0	0	0	0	0	1	0						
15	D3	Diagnostic 3	BL18I-MO-IOC-01	BL18I-DI-PHDGN-03	1	1	0	1	1	0	1	:POSN					
16	AP	Aperture	BL18I-MO-IOC-01	BL18I-AL-APTR-01	0	1	2	0	0	0	0						
17	GBC2	Gas Brem Coll 2	BL18I-MO-IOC-01	BL18I-RS-ABSB-02	0	0	0	0	0	0	0						

- **XML source parsed by Python scripts**
- **Used to generate EDM screens and create db files**
- **Each row producing a different edl**
- **PV tags link to spreadsheet – pulls value and introduces to GUI**
- **Fast and efficient development method**

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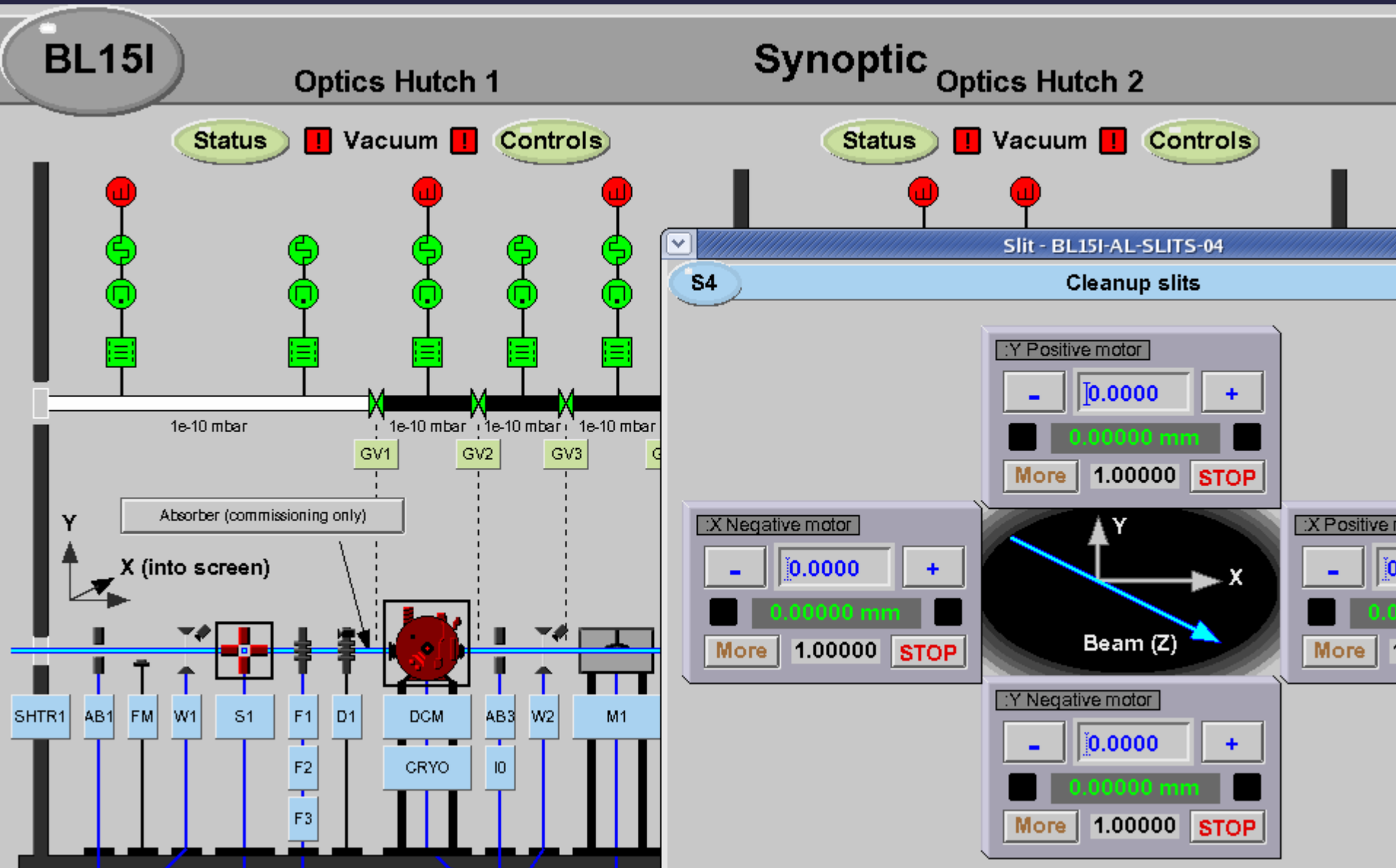
Beamline EDM Synoptic Screens



Looking Forward….

- Remaining Phase I & II commissioning
- Developing Machine – 300mA with stability and topping up
- Completing future building projects and opening
- Now taking proposals for next set of users set to begin October this year
- Now in transition stage from construction to operation…