

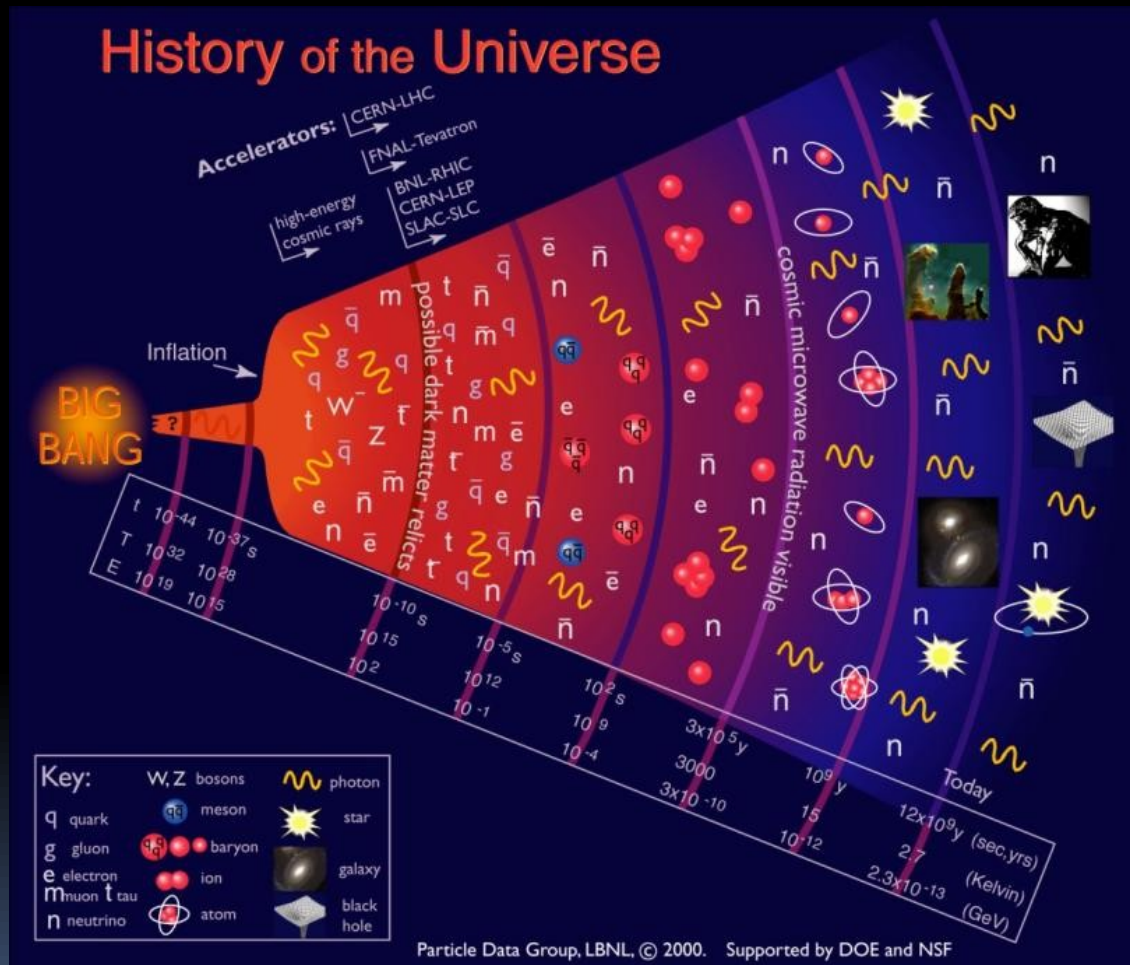
Super-B Workshop Welcome!

Andrei A. Seryi

John Adams Institute for Accelerator Science

**University of Oxford and Royal Holloway University of
London, UK**

Accelerators help in uncovering the origin of the universe

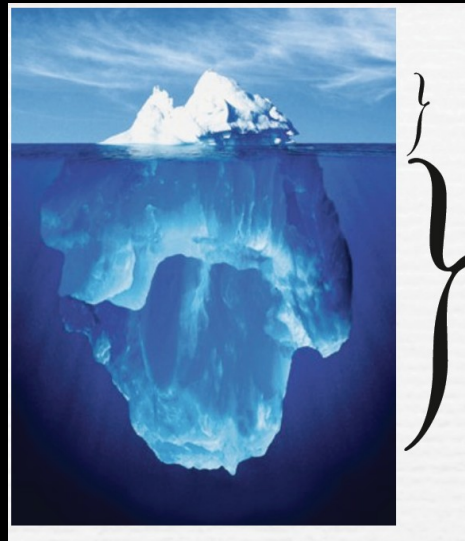
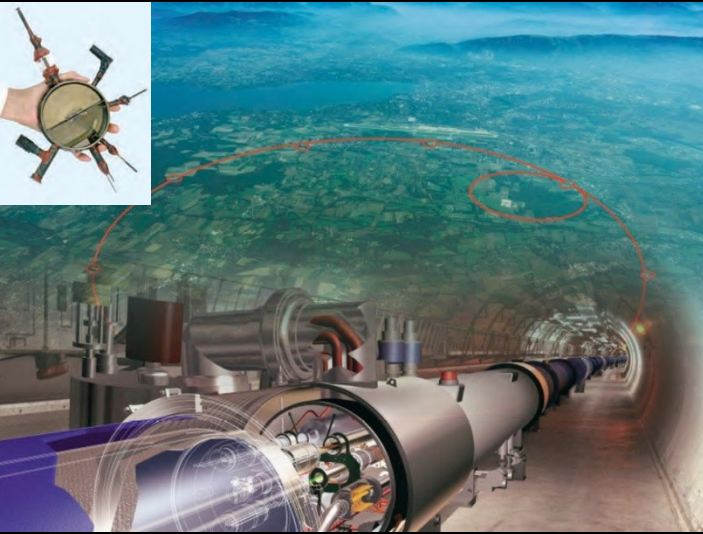


Older larger ... colderless energetic

LHC collider will help in answering the profound questions:

What causes mass?

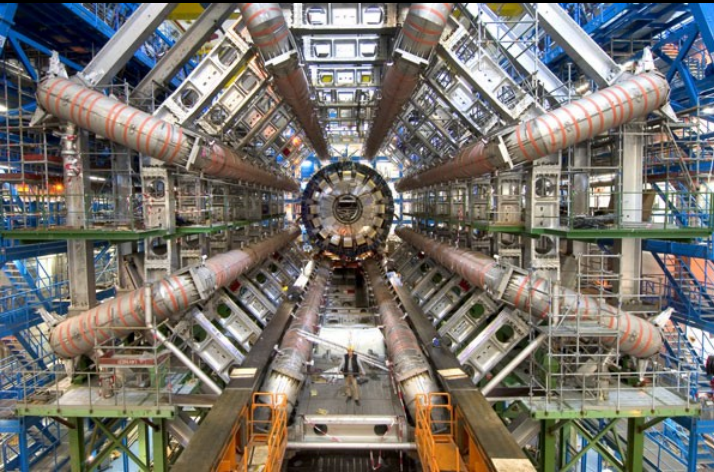
What is the composition of the universe?



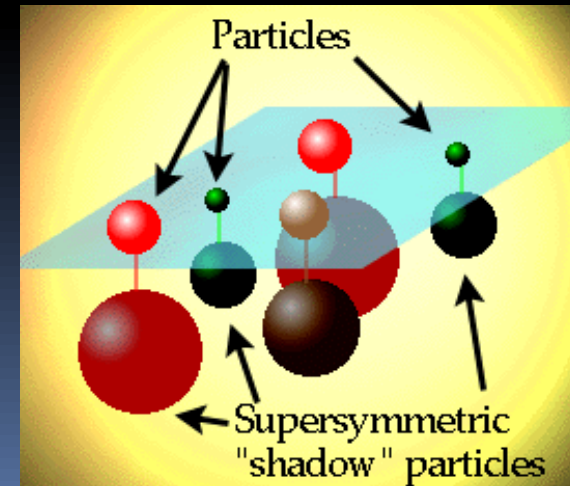
Known Matter

Unknown Matter ~ 90%

DARK MATTER &
DARK ENERGY



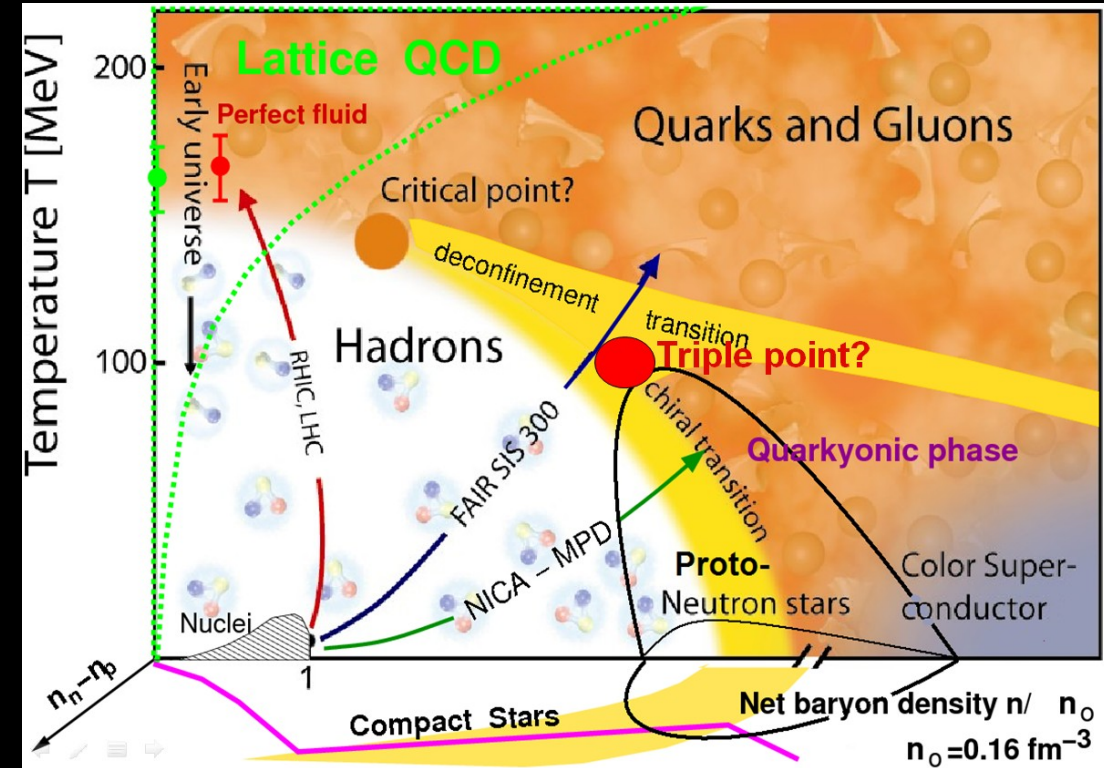
What is Dark Matter?
A new form of elementary
particle?



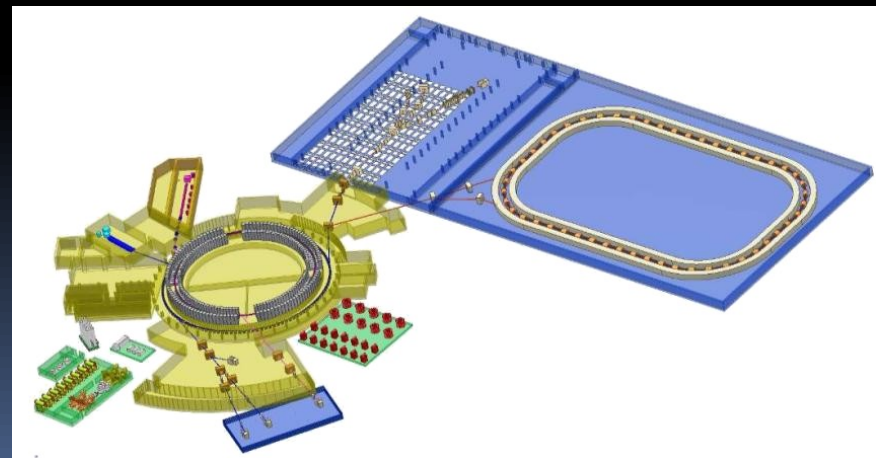
exploring nuclear
 matter at extreme
 states

NICA / MPD

**Nuclotron-based Ion
 Collider Facility**



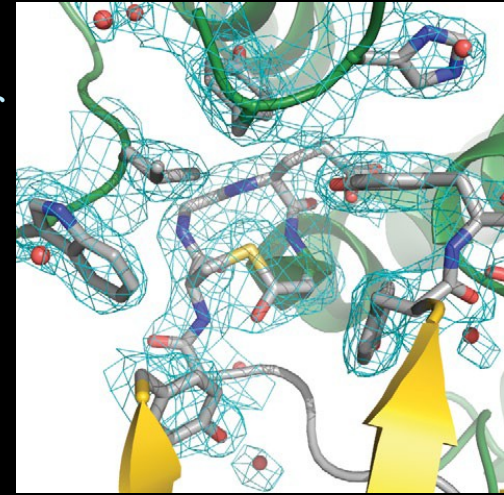
**FAIR, Facility for Antiproton
 and Ion Research**



Accelerators & discovery science



Protein structure revealed with help of light sources



ISIS and Diamond neutron and X-ray sources
Harwell, UK

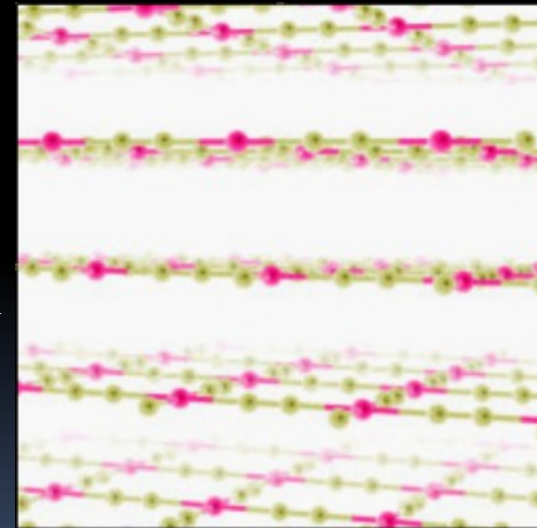
Neutron and X-ray imaging essential for studies of proteins and advanced materials

Accelerators enabled many discoveries

The fraction of the Nobel prizes in Physics directly connected to accelerators is about 30%



2-d material (graphene)

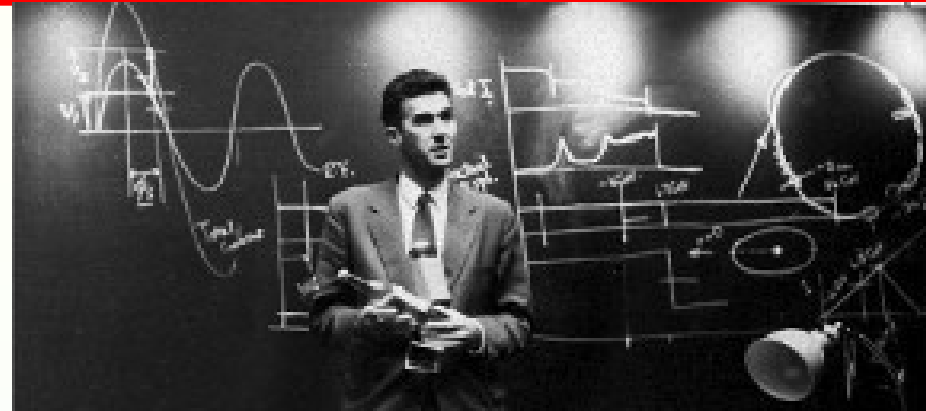


What is JAI

- **The John Adams Institute for Accelerator Science is a centre of excellence in the UK for advanced and novel accelerator technology, created in 2004 to foster accelerator R&D in the universities**

JAI Mission:

- 1) develop novel and advanced accelerator technologies for particle physics and other applications;
- 2) train a new generation of accelerator scientists and engineers;
- 3) disseminate knowledge about the benefits of accelerator technology to a wide community;
- 4) make major contributions to the design and development of new particle physics facilities;
- 5) make a major contribution to the development of new scientific facilities such as new light and neutron sources;
- 6) make a major contribution to the development and construction of applied accelerator technologies (medical, energy etc).



Sir John Adams (24 May 1920 - 3 March 1984) was the 'father' of many accelerators at CERN

JAI Faculty



Riccardo Bartolini



Grahame Blair



Stewart Boogert



Phil Burrows



John Cobb



George Doucas



Brian Foster



Simon Hooker



Pavel Karataev



Steve Molloy (now ESS)



Ken Peach



Chris Prior



Armin Reichold



Andrei Seryi



Roman Walczak

Research Facilitator [FACETS]



Michele Warren



Ted Wilson

Particle Therapy Cancer Research Institute

Bleddyn Jones

~15 Faculty
~12 Research Staff
~12 Technical Staff
~30 Research Students
4 shared Administrative & Secretarial Staff

(2/3rd Oxford:1/3rd RHUL)

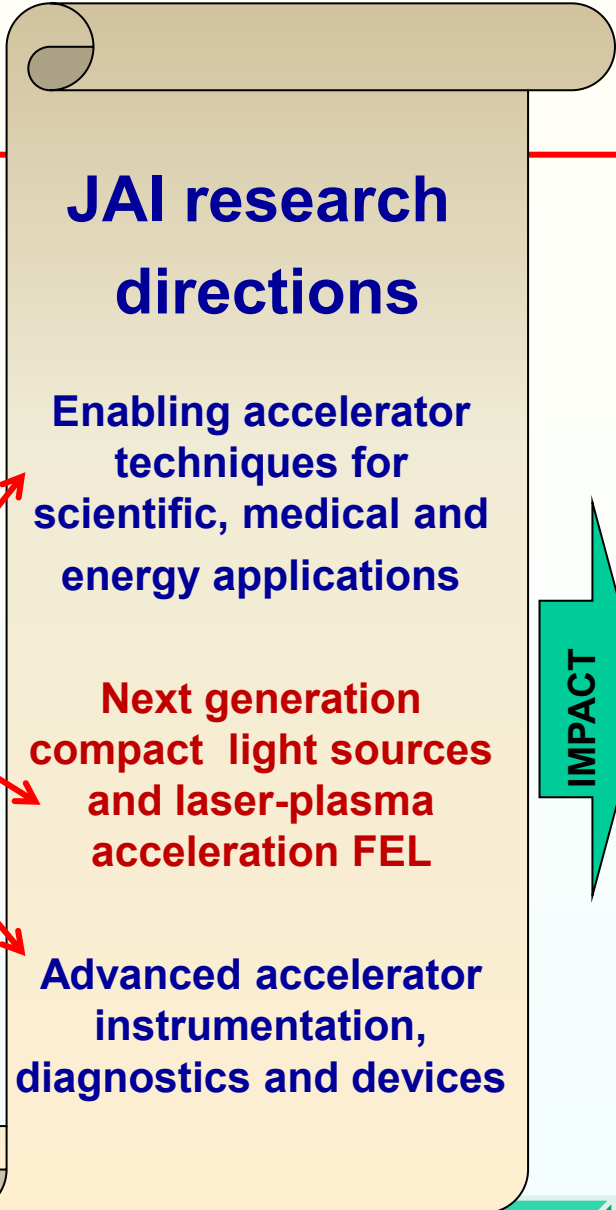
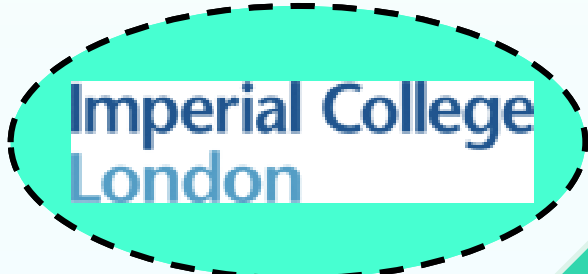


Emmanuel Tsesmelis

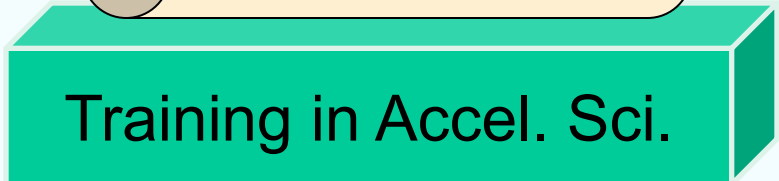
CERN



JAI is moving INTO new directions

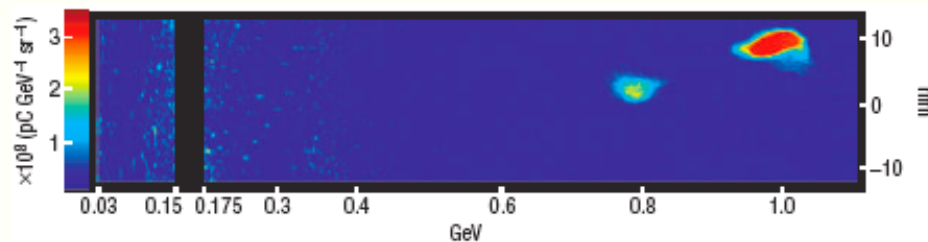
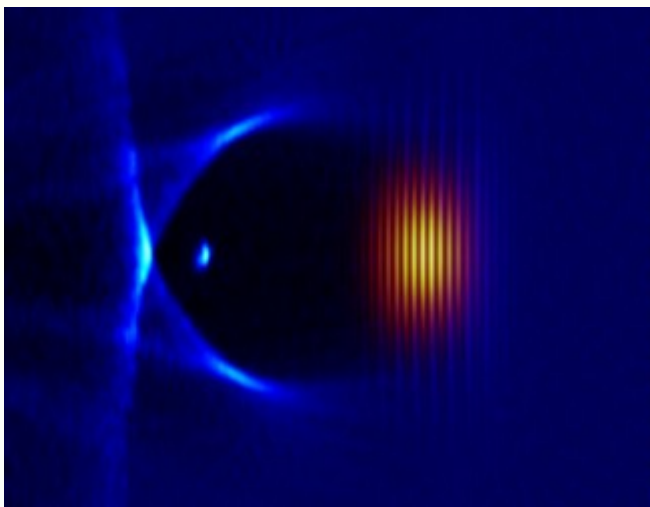


- Discovery Science
- Industry
- Energy challenges
- Societal benefit



Enhance science, training and impact

New directions: Laser-Plasma Acceleration



1 GeV acceleration in just 3cm of plasma

W. Leemans, B. Nagler, A. Gonsalves, C. Toth, K. Nakamura, C. Geddes, E. Esarey, C. B. Schroeder, & S. Hooker, *Nature Physics* 2006

← **Simulation of laser-plasma acceleration**

Rapid progress in beam energy achieved with laser-plasma acceleration shows that the synergy of accelerators, laser and plasma is revolutionizing the field

→ **Compact X-ray light sources based on laser-plasma accelⁿ**

→ **Aim to develop commercial applications**

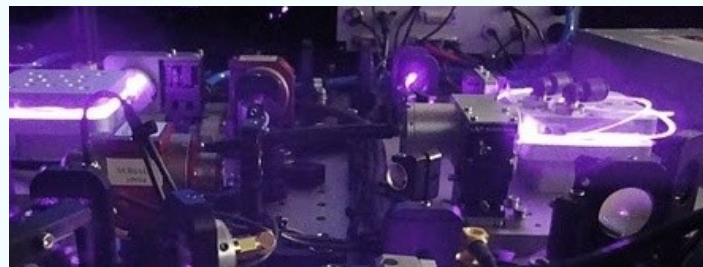
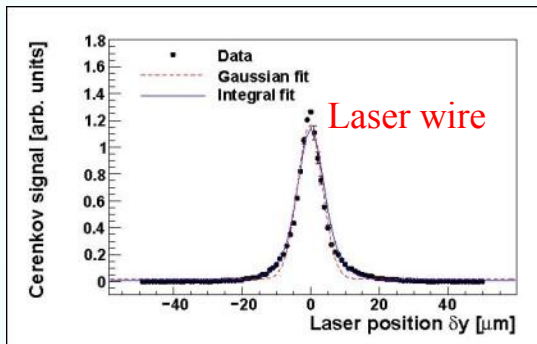
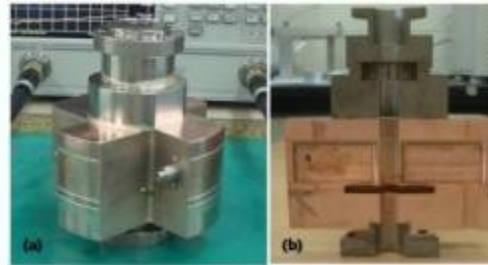
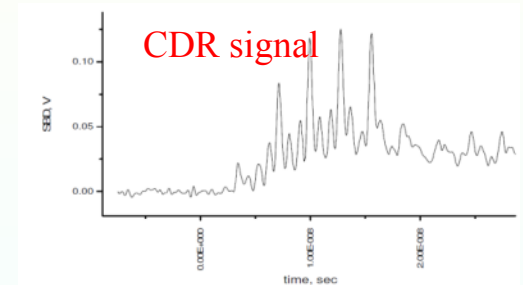
Project to be developed in collaboration with science centres in UK and worldwide

Advanced beam instrumentation

- **Far-Infrared Coherent Radiation**
 - CSR, CDR for beam diagnostics
 - Soft-X ray and microwave source based on Thomson scattering of CDR (with KEK)
- **Nano-resolution BPM**
 - C, S-band (~100nm resol.)
 - Special ~nm resolution
- **Coherent Smith-Purcell radiation**
 - Longitudinal diagnostics – explore extending it to fs range
- **Laser – wire**
- **Ultra-fast nanosecond feedback**



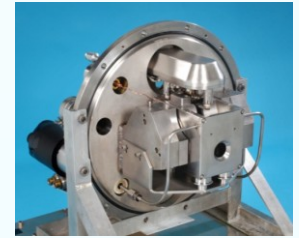
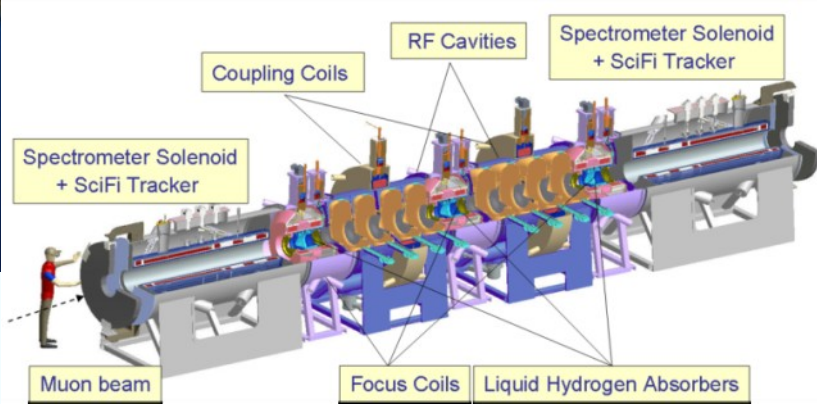
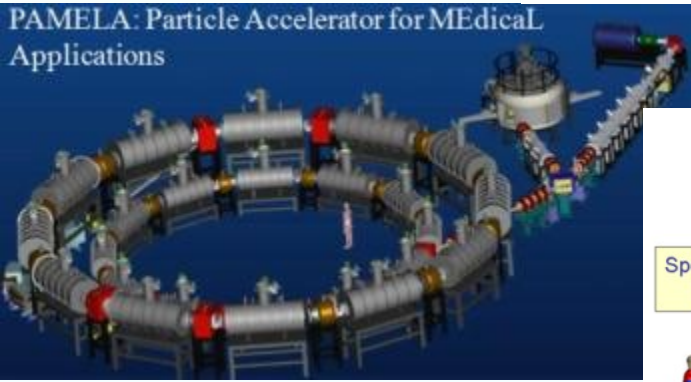
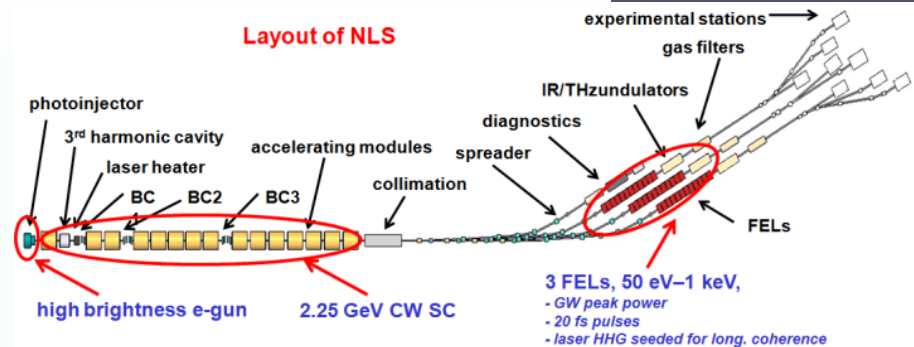
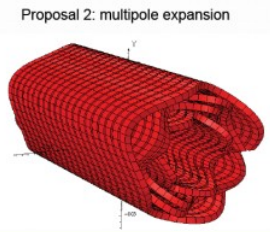
LUCX at KEK



Smith-Purcell diagnostics at ESA, SLAC [JAI team]

Enabling accelerator techniques

- Diamond Light Source
- Future Light Source design
- European Spallation Source
- Muon Cooling & future facilities
- EMMA/ PAMELA and cancer therapy
- LHC upgrade
- LC



ISIS R&D H- source

Advanced Instrumentation, diagnostic and devices

Laser Wire

FONT

Smith Purcell

Nano BPM

ODR/CDR

Next generation compact light sources and laser-plasma FEL

L-P Compact source

Lasers 4 Accelerators

L-P towards FEL

High f rep laser for LP

Enabling accelerator techniques for scientific, medical & energy applications

Diamond Light Source

ISIS

ESS

MICE / NF

PAMELA/EMMA, PTCRi

LHC Upgrade

Future Light Source

Future high W p

LC

O U T R E A C H

Seminars

Meetings

Exhibitions

Training: Accelerator Science & Laser & Plasma

Graduate Courses

Undergraduate Courses

Schools and Workshops

JAI Portfolio of projects

Advanced Instrumentation, diagnostic and devices

Next generation compact light sources and laser-plasma FEL

Enabling accelerator techniques for scientific, medical & energy applications

Laser Wire

FONT

Smith Purcell

Nano BPM

ODR/CDR

L-P Compact source

Lasers 4 Accelerators

L-P towards FEL

High f rep laser for LP

Diamond Light Source

ISIS

ESS

MICE / NF

PAMELA/EMMA, PTCRI

LHC Upgrade

Future Light Source

Future high W p

LC

Synergy w Super-B

Training: Accelerator Science & Laser & Plasma

O
U
T
R
E
A
C
H

Seminars

Meetings

Exhibitions

Graduate Courses

Undergraduate Courses

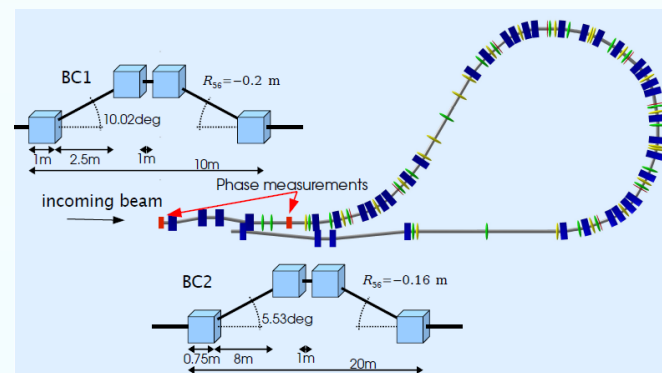
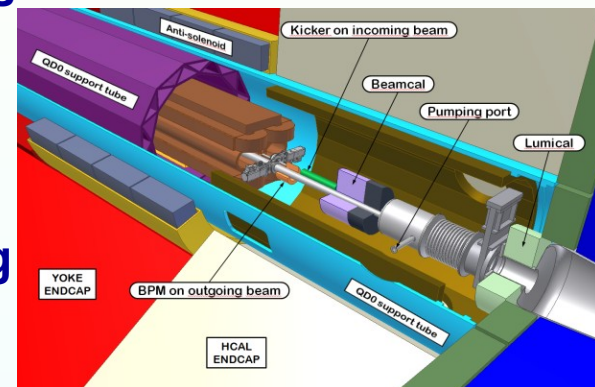
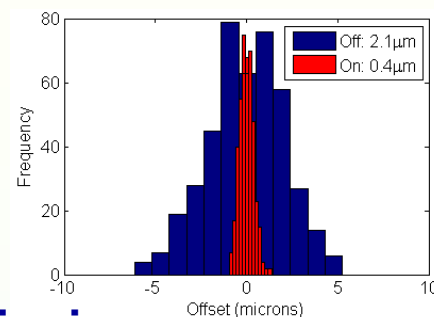
Schools and Workshops

FONT fast feedback R&D



Philip Burrows, Glenn Christian, *Javier Resta Lopez*, Colin Perry, Ben Constance, Robert Apsimon, Douglas Bett, Alexander Gerbershagen, Michael Davis, Neven Blaskovic

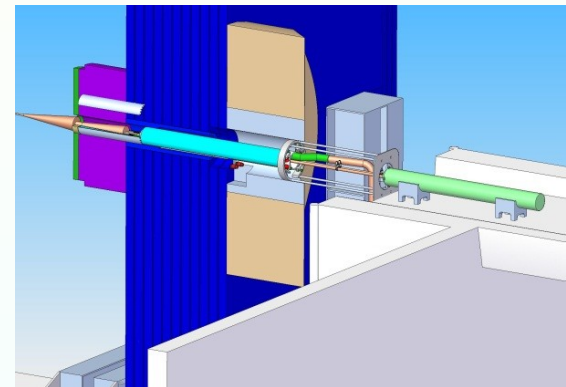
- ILC intra-train FB prototype at ATF2:
- ILC goals met: latency, BPM resolution, drive
- Beam correction demonstrated to 400nm level
- y, y' coupled-loop FB (ATF goals 1,2) commissioning
- ILC + CLIC interaction point collision FB:
- Conceptually engineered designs within MDI
- Documented in CLIC CDR, design iterations ongoing
- Luminosity performance simulations
- **CLIC drive-beam phase stability FF system:**
- **Conceptual design now documented in CDR**
- **Amplifier design in progress: aiming for CLIC**
- **prototype and beam tests at CTF3 (2014)**



Machine Detector Interface & Final Focus

ILC/CLIC MDI panel establishing parameters for:

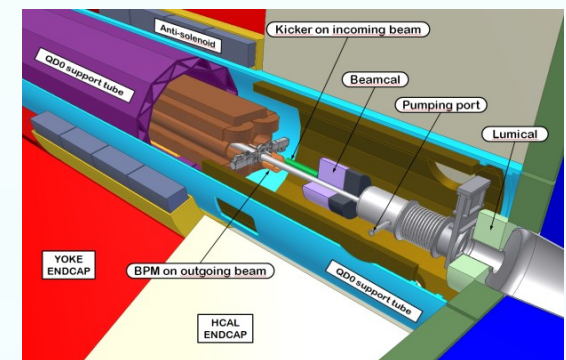
- IR hall size, layout, access shafts, crane coverage, facilities + services ...
- push-pull scheme for SiD + ILD detectors (platform, motion system, alignment ...)
- backgrounds + radiation shielding
- detector assembly/access scheme
- support scheme for QD0s within detector
- QD0 - QD0 relative stability + alignment
- QD0 - QF1 interface + alignment
- IP feedback integration ...



CLIC MDI team (PB) – many common issues

- contributed IP feedback sections to MDI chapter of CDR

Final Focus expertise



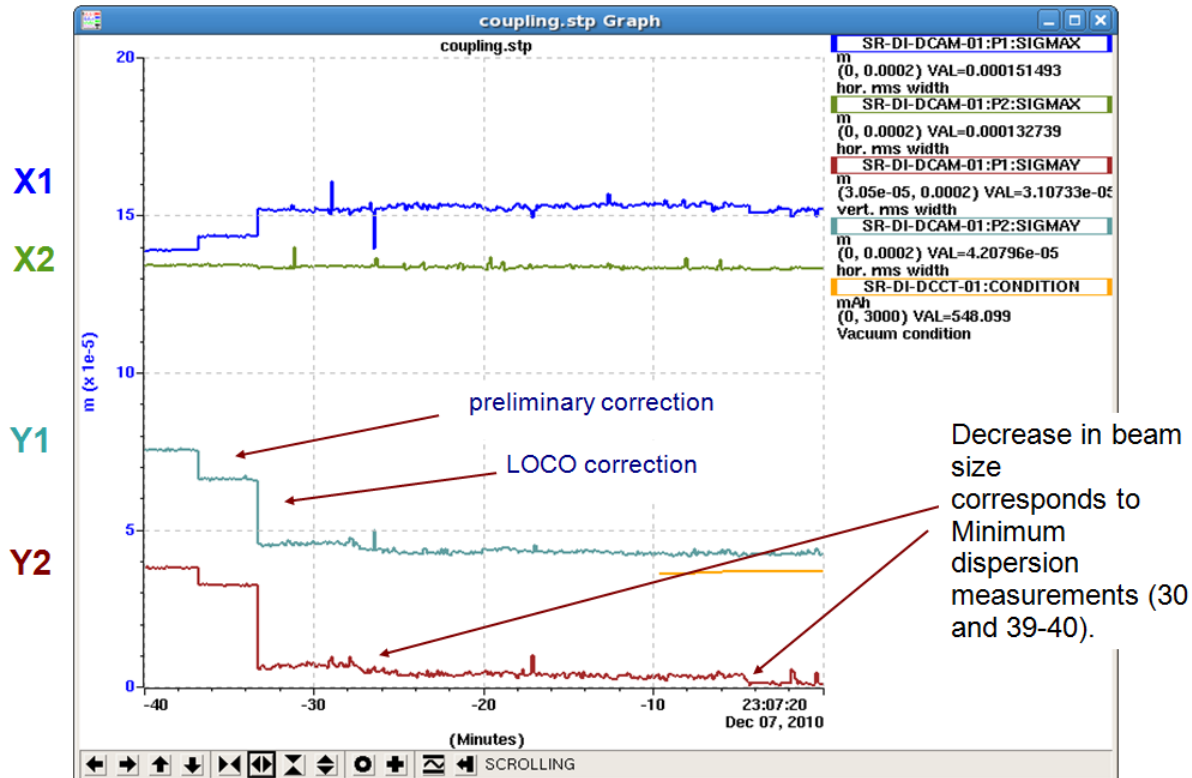
Generic expertise applicable to other projects (eg. SuperB, ...)

Low emittance tuning at Diamond for SuperB



Last year results on low emittance tuning and the achievement of a vertical emittance of 2.2 pm have sparked quite some interest from the Damping ring community (CLIC and ILC) and from the Super B

In collaboration with the SuperB team (P. Raimondi, M. Biagini, S. Liuzzo) Diamond has been used as a test-bed for new techniques for low emittance tuning based on **dispersion free steering and coupling free steering.**



4 MD shifts at DLS
November - February



New JAI PhD student to start in October

SuperB miniworkshop

- Main Page
- Agenda
- Transport
- Local Facilities
- Contact



The John Adams Institute and the Physics Department of QMUL are organising a mini-workshop to explore the possible interests of the UK accelerator and detector communities in the recently funded SuperB project.

The aim is to provide updated information on the various aspects of the project and to participate in discussions so that anyone with a potential interest in SuperB has the opportunity to step forward and participate.

The meeting will take place at Jesus College, Oxford on 18th and 19th of May 2011

For further information and to register your interest, please click on the contact link on the left

For further details about the meeting, please email s.geddes1@physics.ox.ac.uk.




The aim is to explore possible interests in the UK accelerator and detector community in the SuperB


and

to participate in discussion so that anyone with a potential interest in SuperB has to opportunity to step forward and participate

SuperB miniworkshop



Main Page
 Agenda
 Transport
 Local Facilities
 Contact



The John Adams Institute and the Physics Department of QMUL are organising a mini-workshop to explore the possible interests of the UK accelerator and detector communities in the recently funded SuperB project.

The aim is to provide updated information on the various aspects of the project and to participate in discussions so that anyone with a potential interest in SuperB has the opportunity to step forward and participate.

The meeting will take place at Jesus College, Oxford on 18th and 19th of May 2011

For further information and to register your interest, please click on the contact link on the left

For further details about the meeting, please email s.geddes1@physics.ox.ac.uk.

Strong expertise in accelerator science in
 Diamond
 Cockcroft Institute
 John Adams Institute
 ASTEC, RAL
 UK Universities

Many synergies with ongoing R&D that will be beneficial for core UK expertise

Hope to have stronger collaboration on Super-B as a result of this meeting