

Advanced  
LIGO UK

## Advanced LIGO UK participation

Justin Greenhalgh, Rutherford  
Appleton Lab

LSC, August 2003

LIGO-G030424-00-K

ALUKRAL0013aAUG03

- PPARC role in Advanced LIGO
- The UK Partners
- The UK work packages
- UK organisation
- Plans
- People and groups

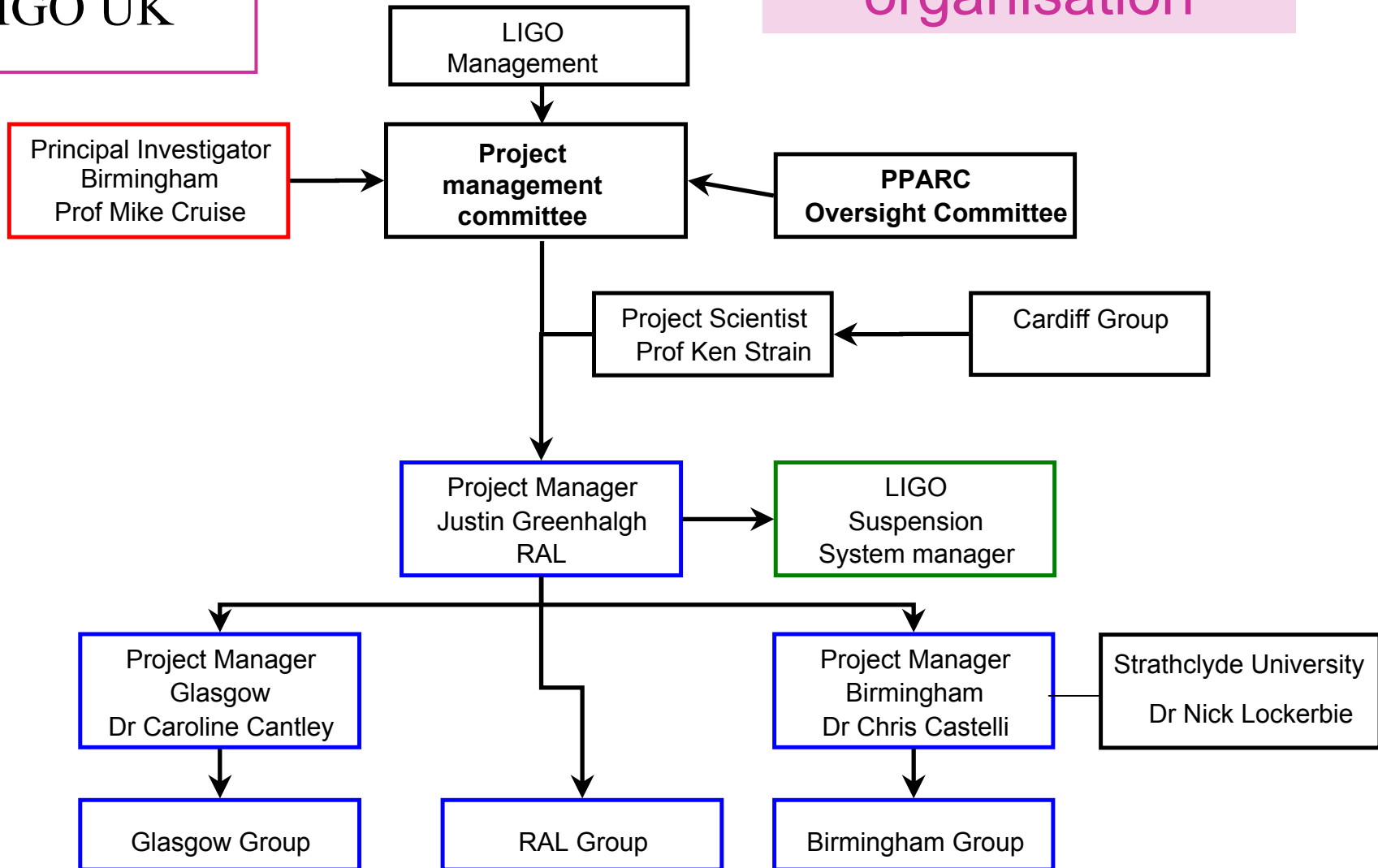
- Funding activities in the UK through grants to Glasgow and Birmingham
- Total funding **of order** \$10M
- UK input is in the fields of suspension science and optics
- Payback is in access to Advanced LIGO data

- **University of Glasgow**
  - Scientific guidance
  - Providing mirror blanks and some “ears” for fibre bonding
- **University of Birmingham + University of Strathclyde**
  - OSEM (sensor/actuator) units for noise prototypes
  - Drive electronics for ALL OSEMs
- **CCRLC Rutherford Appleton Laboratory**
  - SUS mechanical parts + OSEMs for all BSC SUS
  - Management of UK program
- **University of Cardiff**
  - Scientific guidance

- WP1 – management of UK program (RAL)
- WP2 – scientific guidance (UoG)
- WP3 – SUS mechanics + OSEMs (RAL)
- WP4 – drive electronics + prototype OSEMs (Birmingham)
- WP5 – optics (Glasgow)

# Advanced LIGO UK

# The UK organisation



- There will be a scientific/managerial “Oversight Committee” set up by PPARC
- There is a ~monthly UK project management committee
- Each WP has a WP manager who looks after planning, money, and day-to-day management of their WP.

- OSEMs – work already going on to develop better sensor noise
  - and to decide how good it needs to be
- Discussions started on input to controls prototype
  - not in original proposal but
  - changes have opened up a window of opportunity
- Firming up on details of UK scope and spec
  - Eg scope in proposal included assembly tooling but not installation tooling. Is this really sensible?
  - Eg OSEM force requirements may not be the same for all OSEMs
- Firming up schedules
  - Key dates are prototype trials in LASTI and delivery of final items to the three IFOs

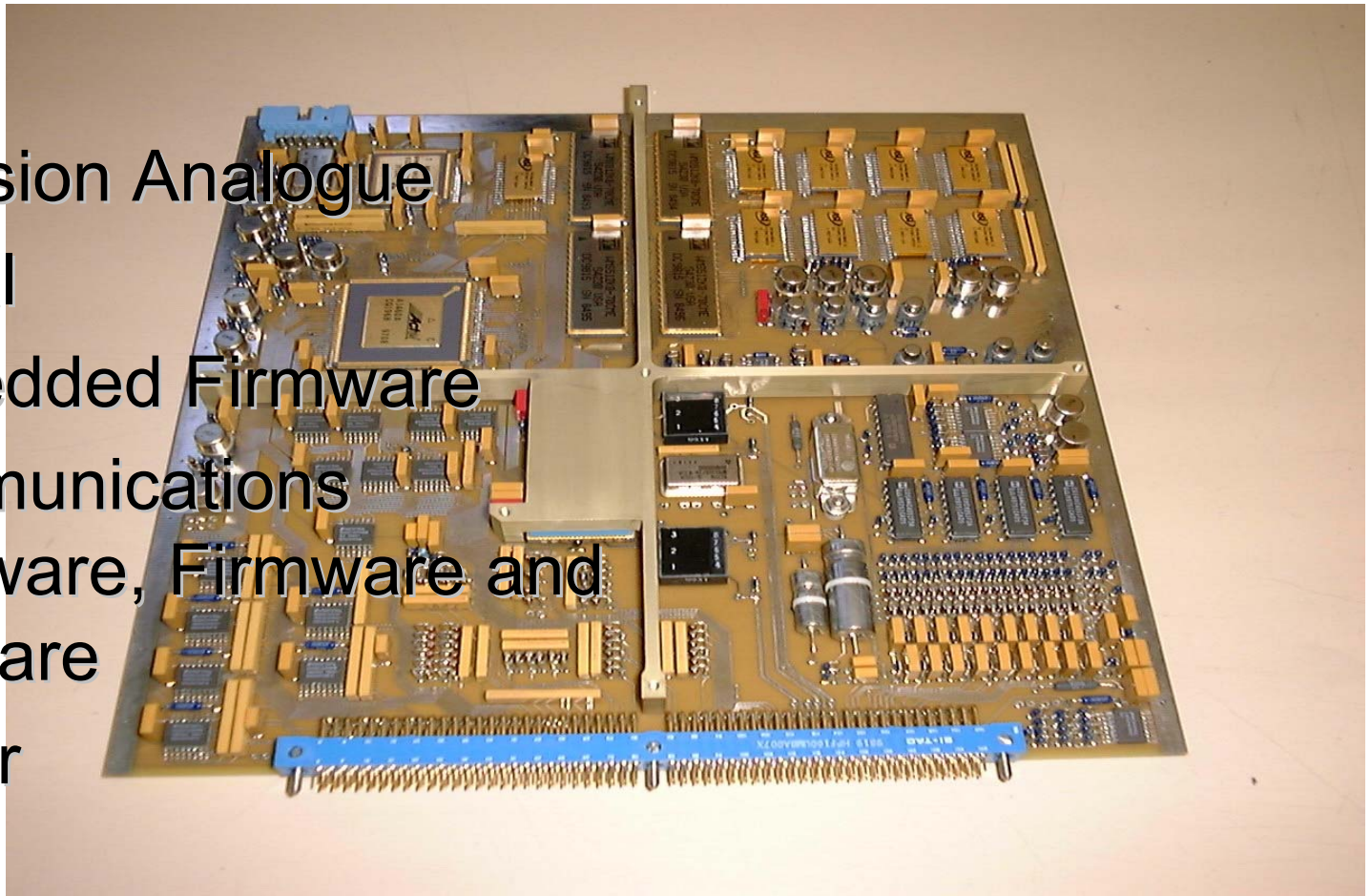


- Fall 2003
  - Complete R&D program on OSEM sensor technologies
  - Start design work on Controls prototypes (blades and clamps)
- 2004
  - Complete Controls prototype work
  - Detailed design of drive electronics
  - Build UK SUS concept model
  - Start noise prototype SUS design
- 2005
  - Start build of OSEMs and electronics for noise prototypes
  - Start build of mechanics for noise prototypes
- 2006 Noise prototype tests
- 2007 Manufacturing
- 2008 Installation

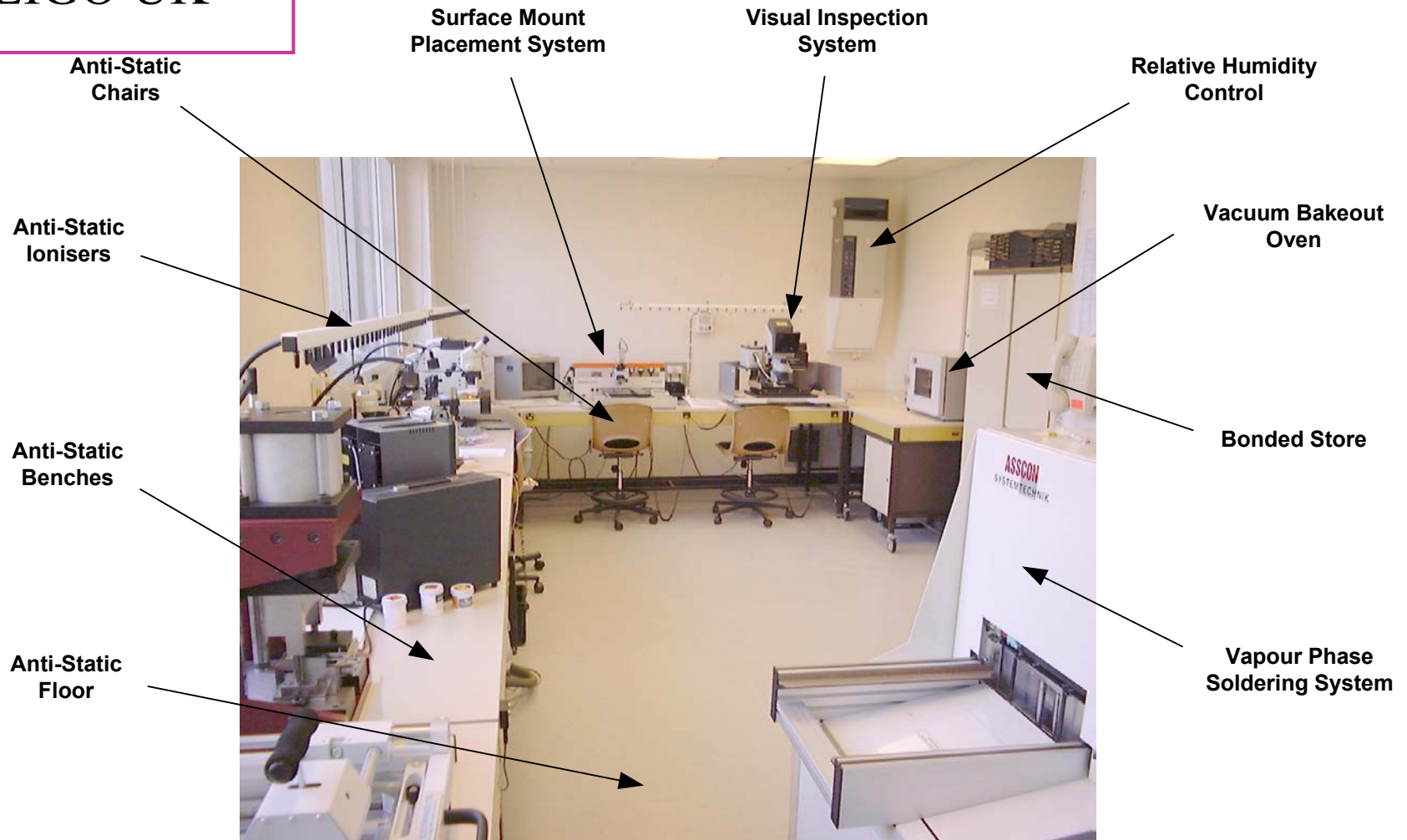
- Overall
  - Jim Hough overall UK PI
- Glasgow
  - Ken Strain leading science input
  - Caroline Cantley leading engineering input + PM
- Birmingham
  - Alberto Vecchio leading science input
  - Dave Hoyland leading engineering input
  - Chris Castelli leading project management
- Rutherford
  - Justin Greenhalgh leading engineering input + PM
  - Ian Wilmut, Tony Jones design engineers

- Experience in Gravitational Wave Astronomy
- Experience in Scientific Instrument design
  - Thirty five years experience in space projects with NASA,ESA, CNES, RKA, ISAS
  - Four instruments in Orbit ( XMM-Newton, SOHO-LASCO, Ulysses Hi-Scale, ACE-EPAM )
  - Four instruments in preparation (SMEI, Solar-B, STEREO, Beagle-2)
- Substantial experience collaborating with foreign partners, especially in the US
  - NASA
  - NRL
  - UCSD
  - Stanford, etc.

- Precision Analogue
- Digital
- Embedded Firmware
- Communications Hardware, Firmware and Software
- Power



# Flight Electronics Fabrication Facility (1)



Lead Forming  
and Cropping  
Press

Solder Paste  
Applicator



Binocular  
Inspection  
Microscope

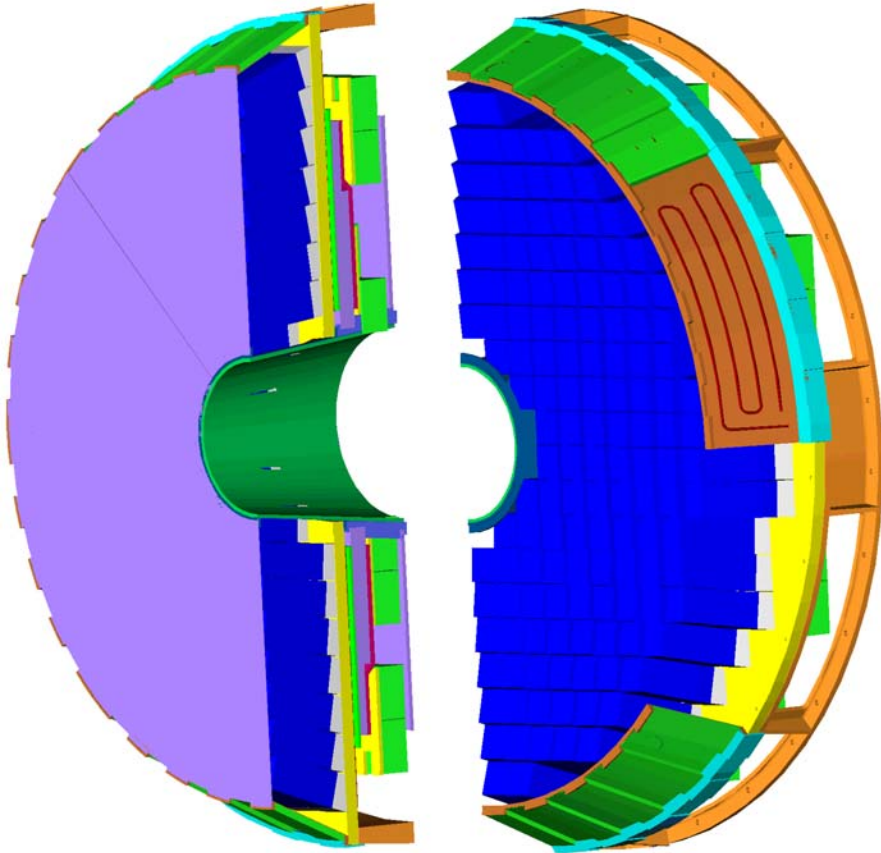
Surface Mount  
Re-work Station

Hand-Soldering  
Station



- Around 1200 staff
- Involved at the interface between science and engineering
- Several major facilities, two large upgrades in hand
- Engineering Department has around 120 staff providing engineering support inside and outside RAL

## CMS Ecal end caps



RJSG is project engineer  
managing ~6 staff over  
several years

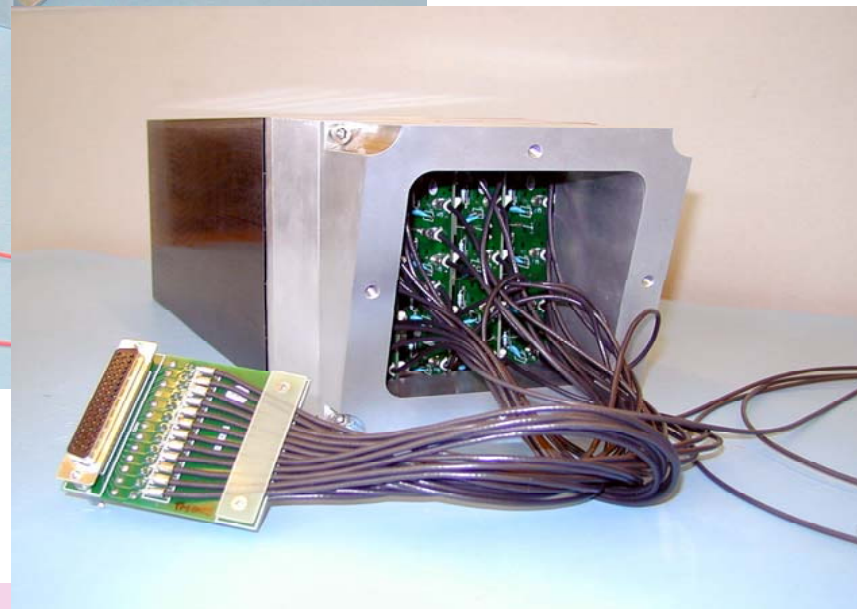
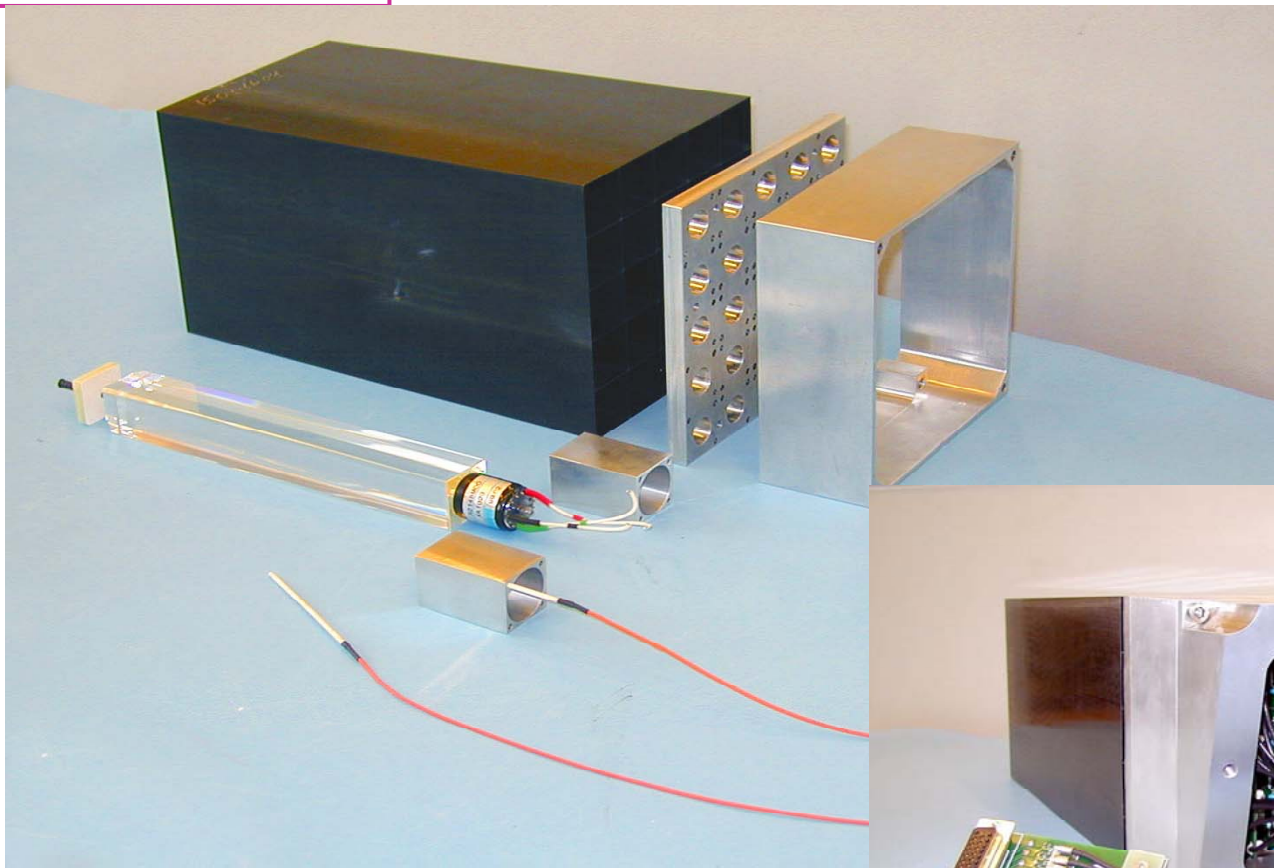
interfaces to  
collaboration (Russia,  
Switzerland, France,  
others)

Approx £20M total value



Advanced  
LIGO UK

## CMS EE Supercrystals



G030424-00-K

# Advanced LIGO UK

## Recent CLRC projects

