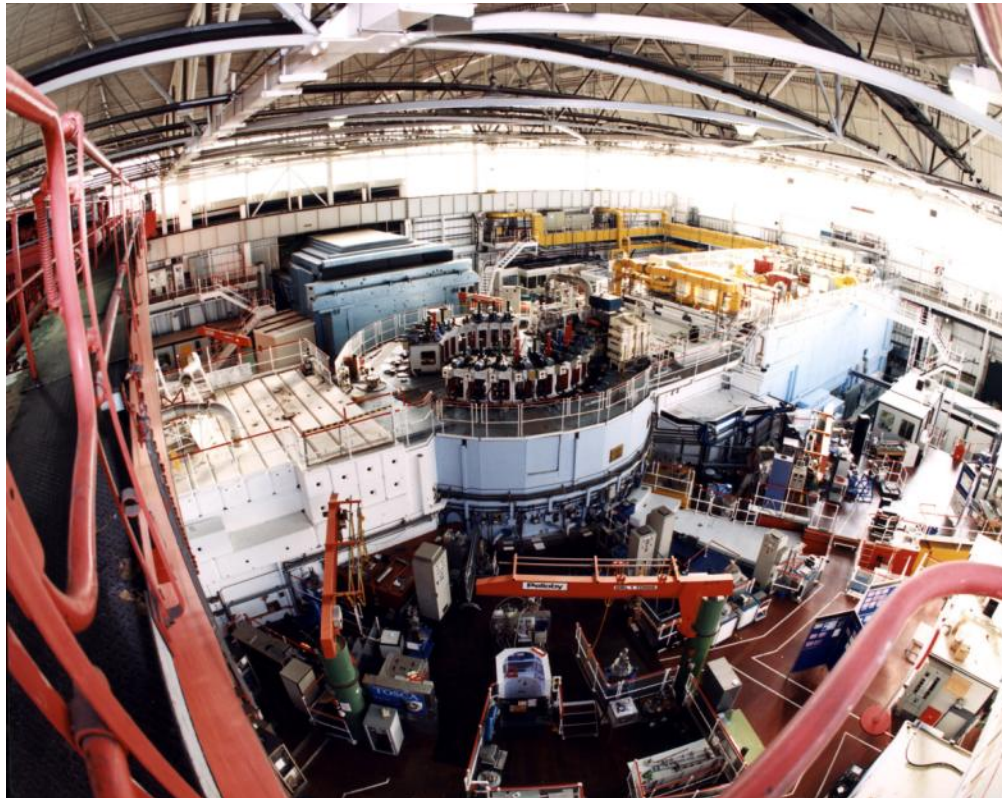


# ICAT at ISIS



Tom Griffin, STFC ISIS Facility  
ICAT Workshop  
ILL, Grenoble

March 2012

[tom.griffin@stfc.ac.uk](mailto:tom.griffin@stfc.ac.uk)



Science & Technology Facilities Council

ISIS

# ICAT at ISIS

- Data Volume and Rates
- Getting the data in
- Getting the data out
- DOIs – data citation
- Next....



# Volume and Rates

- Pulsed Neutrons and Muons
- Nexus, RAW and Log (txt)
- Operating since 1984
- 2000 users ; 800+ experiments
- Volume of data 10TB
- 8M datafiles
- 10GB metadata, >60M rows



# ISIS – Volume and Rates

	Files/15 minutes	Files/minute	Files/second
Peak	10857	724	12.06
Mean	968	65	1.08
Median	263	18	0.29

Peak - 4 hours averaging of 6.4 files/sec (384/minute)



Science & Technology Facilities Council

ISIS

# Getting data into ICAT

- Pre-experiment....
- C#
- Reads metadata from
  - Proposal system
  - ‘Visits’ system
  - ‘Risk Assessment system



# Getting data into ICAT

- During the experiment
- C# - 'ICATIngest'
- Subscribes to Windows events  
`ReadDirectoryChangesW()`
- Invokes 'WriteRaw' and 'NxIngest'
- Caches groups of files for performance

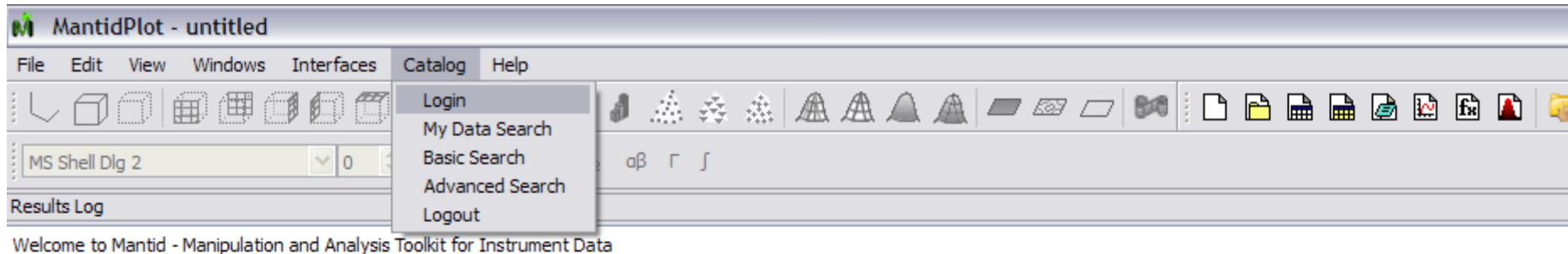


# Getting Data out - Web Access


- TopCAT interface (see Antony's talk)
- Main point of access for ISIS data
- HTTP file serving
- Zipped or non-zipped



# Getting Data out - Mantid





 CatalogLogin input dialog ? X

Connects to information catalog using user name and password.

Username

Password  \*

? Run Cancel



MantidPlot - untitled

File Edit View Windows Interfaces Catalog Help

MS Shell Dlg 2 0 B It U x<sup>2</sup> x<sub>2</sub> αβ Γ f

Results Log

Welcome to Mantid - Manipulation and Analysis Toolkit for Instrument Data  
CatalogLogin started  
CatalogLogin successful, Duration 1.63 seconds  
CatalogMyDataSearch started  
CatalogMyDataSearch successful, Duration 1.30 seconds

My Data Search Results

Search Results : 8 Investigations Found

InvestigationId	Proposal	Title	Instrument	Run R
24088059	1120157	Fluctuating stripes in an insulating hole-doped antiferromagnet	EMU	26352-
24088350	1120344	Magnetic Ordering in the Candidate Random Quantum Spin Chain Sr <sub>3</sub> CuPbIr <sub>1-x</sub> O <sub>6</sub>	EMU	27801-
24086010	1110332	Motion of Positively Charged Muonium Centres in Transparent Conducting Oxides	EMU	24428-
24003275	720206	Single-Crystal Neutron Diffraction Study on [U(C5Me5)2(H)(μ-H)] <sub>2</sub>	SXD	19913-
24079466	1010392	Smectic Wetting at Nematic Surfaces	EMU	24943-
24086550	1110191	Source of Electronic Magnetism in Palladium Bionanoparticles	EMU	24943-
24087928	1193027	Testing postal address	LOQ	

Workspaces

Load Delete Group

Sort

Workspaces

- MyInvestigations

Algorithms

Execute

Algorithms

- Arithmetic
- CorrectionFunctions
- Crystal
- DataHandling
- Deprecated
- Diagnostics
- Diffraction
- Events
- General
- Inelastic
- MDAlgorithms
- Muon
- Optimization

Details



MantidPlot - untitled

File Edit View Windows Interfaces Catalog Help

MS Shell Dlg 2 0 B It U x<sup>2</sup> x<sub>2</sub> αβ Γ f

Results Log

```

CatalogLogin started
CatalogLogin successful, Duration 1.63 seconds
CatalogMyDataSearch started
CatalogMyDataSearch successful, Duration 1.30 seconds
CatalogGetDataSets started
CatalogGetDataSets successful, Duration 0.25 seconds
CatalogGetDataFiles started
CatalogGetDataFiles successful, Duration 39.94 seconds
CatalogGetDataFiles successful, Duration 30.94 seconds

```

Results : 8 Investigations Found

	Instrument	Run R
insulating hole-doped antiferromagnet	EMU	26352-
Candidate Random Quantum Spin Chain Sr <sub>3</sub> CuPtIr <sub>1-x</sub> O <sub>6</sub>	EMU	27801-
arged Muonium Centres in Transparent Conducting Oxides	EMU	24428-
Diffraction Study on [U(C <sub>5</sub> Me <sub>5</sub> ) <sub>2</sub> (H)(μ <sub>H</sub> )] <sub>2</sub>	SXD	19913-
natic Surfaces	INTER	9594-9
agnetism in Palladium Bionanoparticles	EMU	24943-
	LOQ	

Investigation Data

Data: 7082 DataFiles found

Data:

- ProposalId: 720206
  - Title: Single-Crystal Neutr...
  - Instrument: SXD
  - Run Range: 19913-20620
    - Runs
      - Status: complete
      - Type: experimen...
      - Description: SXD...

Name	
SXD19913.RAW	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19913_Beam_Current.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19913_Head_MaxPower.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19913_Head_Temp.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19913_ICPevent.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19913_Sample_MaxPower.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19913_Sample_Setpoint.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19913_Sample_Temp.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19913_Status.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19913_WCCR.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19914.RAW	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19914_Beam_Current.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19914_Head_MaxPower.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19914_Head_Temp.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di
SXD19914_ICPevent.txt	\\isis\inst\$\Instruments\$\NDXSXD\Instrument\di

Help ☐ Controlled loading ☐ DataFiles

Workspaces

Load Delete Group

Sort

Workspaces

- MyInvestigations
- datasets
- datafiles

Algorithms

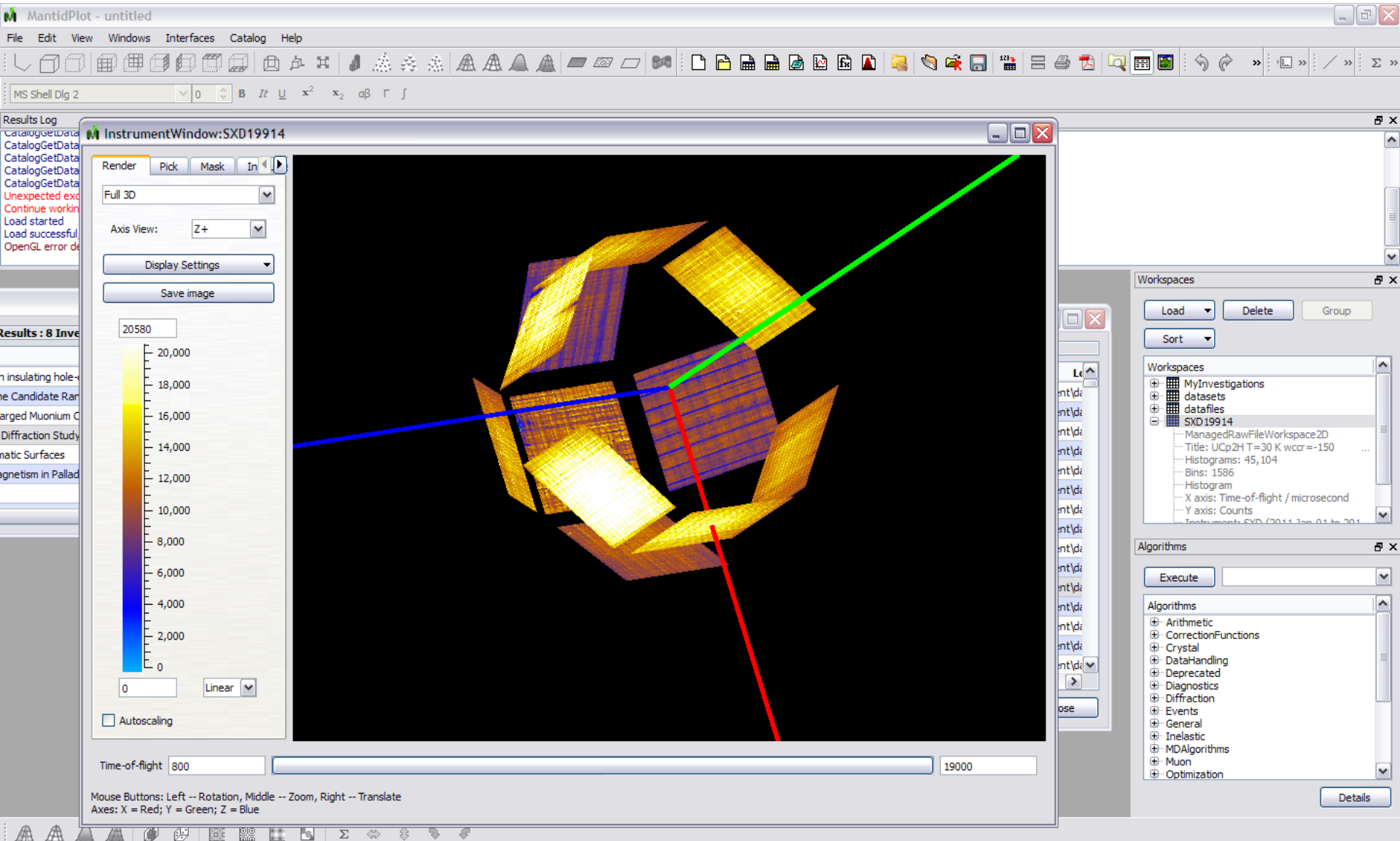
Execute

Algorithms

- Arithmetic
- CorrectionFunctions
- Crystal
- DataHandling
- Deprecated
- Diagnostics
- Diffraction
- Events
- General
- Inelastic
- MDAlgorithms
- Muon
- Optimization

Details





MantidPlot - untitled

File Edit View Windows Interfaces Catalog Help

MS Shell Dlg 2 0 B It U x<sup>2</sup> x<sub>2</sub> α β γ f

**Results Log**

CatalogGetVariables successful, Duration 30.94 seconds  
Unexpected exception: Path not found  
Continue working.  
Load started  
Load successful, Duration 314.88 seconds  
OpenGL error detected in paintEvent: invalid operation  
CatalogListInstruments started  
CatalogListInstruments successful, Duration 0.30 seconds  
CatalogSearch started  
CatalogSearch successful, Duration 7.19 seconds

**Catalog Search**

**Investigations Search**

Run#: 5000 5050 Start Date: / / ... KeyWord(s):  
Instrument: GEM End Date: / / ... ☐ Case Sensitive  
Search

**Search Results : 1 Investigations Found**

InvestigationId	Proposal	Title	Instrument
6209955	11543	BZT 80F Pt-can in-situ T~300 C Beam: 20x35 Nimonic on 19452,19543	GEM

Help

**Workspaces**

Load Delete Group  
Sort

Workspaces

- MyInvestigations
- datasets
- datafiles
- SXD19914
  - ManagedRawFileWorkspace2D
    - Title: UCp2H T=30 K wccr=-150
    - Histograms: 45,104
    - Bins: 1586
    - Histogram
    - X axis: Time-of-flight / microsecond
    - Y axis: Counts

**Algorithms**

Execute

Algorithms

- Arithmetic
- CorrectionFunctions
- Crystal
- DataHandling
- Deprecated
- Diagnostics
- Diffraction
- Events
- General
- Inelastic
- MDAlgorithms
- Muon
- Optimization

Details



MantidPlot - untitled

File Edit View Windows Interfaces Catalog Help

MS Shell Dlg 2

Results Log

Load successful, Duration 514.68 seconds  
OpenGL error detected in paintEvent: invalid operation  
CatalogListInstruments started  
CatalogListInstruments successful, Duration 0.30 seconds  
CatalogSearch started  
CatalogSearch successful, Duration 7.19 seconds  
CatalogGetDataFiles started  
CatalogGetDataFiles successful, Duration 2.42 seconds  
CatalogGetDataSets started  
CatalogGetDataSets successful, Duration 0.23 seconds

Catalog Search

Investigations Search

Run#: 5000 5050 Start Date: / / KeyWord(s):  
Instrument: GEM End Date: / / Case Sensitive

Search

Search Results : 1 Investigations Found

InvestigationId	Proposal	Title	Instrument
6209955	11543	BZT 80F Pt-can in-situ T~300 C Beam: 20x35 Nimonic on 19452,19543	GEM

Investigation Data

Data: 399 DataFiles found

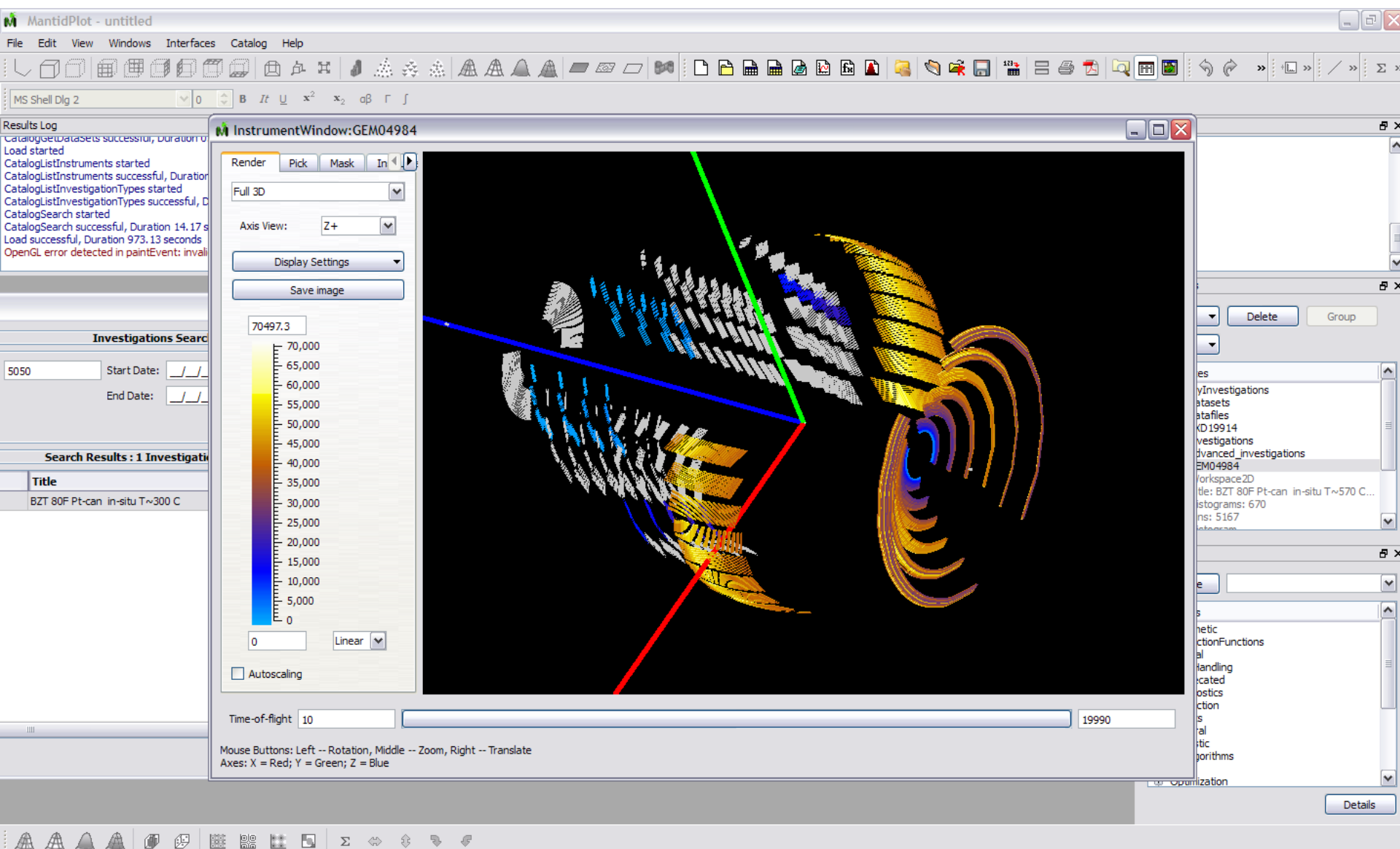
Name	Location
GEM04975.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0497
GEM04976.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0497
GEM04977.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0497
GEM04978.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0497
GEM04979.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0497
GEM04980.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0498
GEM04981.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0498
GEM04982.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0498
GEM04983.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0498
GEM04984.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0498
GEM04985.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0498
GEM04986.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0498
GEM04987.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0498
GEM04988.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0498
GEM04989.RAW	\\isis\inst\$\instruments\$\NDXGEM\instrument\data\cycle_00_2\GEM0498


Help ☐ Controlled loading ☐ DataFiles Select All Files Download Load Close

Optimization

Details









 **Catalog Advanced Search** [-] [X]

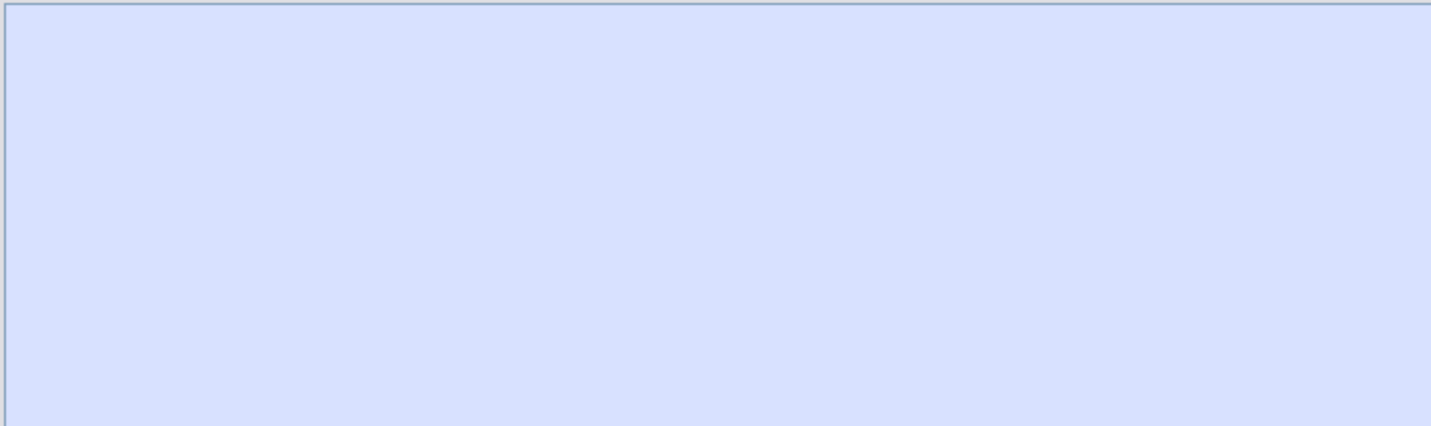
---

**Advanced Investigations Search**

Investigation Name:	<input type="text"/>	StartRun:	<input type="text"/>	EndRun:	<input type="text"/>
Investigation Abstract:	<input type="text"/>	Start Date:	<input type="text"/> 	End Date:	<input type="text"/> 
Sample:	<input type="text"/>	Instrument:	<input type="text"/> 	Investigation Type:	<input type="text"/> 
Investigators surname:	<input type="text"/>	* Datafile name:	<input type="text"/>	KeyWord(s):	<input type="text"/>

☐ Case Sensitive

---







# Catalog Advanced Search

## Advanced Investigations Search

Investigation Name:  StartRun:  EndRun:   
 Investigation Abstract:  Start Date:  ... End Date:  ...  
 Sample:  Instrument:  Investigation Type:   
 Investigators surname:  \* Datafile name:  KeyWord(s):  jaws  
☐ Case Sensitive

Search

## Search Results : 400 Investigations Found

InvestigationId	Proposal	Title	Instrument	Run Range
13541522	11319	(La,Sr)2Mn2O7 (x=0.3) w.b. RT wccr=????	HET	10298, 10299
24002100	0	(LaSr)2MnO3 phi8=90 align	PRISMA	33730-338
11061723	13841	0.348cm vanadium flat plate on C/stick jaws 16.5x26.5 scraper 17x27	SANDALS	22224, 22225
11061728	13827	0.348mm Van plate on C/stick Jaws 40x40 30mm scraper	SANDALS	22295-222
3909512	0	10mm V rod 90-190ms jaws 15*25	HRPD	21961
11061781	13826	11 mm Vn in empty inst. jaws 17.5x17.5	SANDALS	23057-230
6212269	20074	162DyMnO3 T=50K in cryostat Jaws 15x40mm	GEM	28821-288
11061859	0	1mm H2O in TiZr can 4 Position 9 jaws 13.3x13.3	SANDALS	34257
11061865	0	1mm H2O in TiZr can 4 Position 9 jaws 40x40	SANDALS	34355-343

Help



Science & Technology Facilities Council

ISIS

# DOIs – data citation

## • Issued and sometimes used

PHYSICAL REVIEW B 84, 075219 (2011)

### Thickness-dependent magnetic properties of oxygen-deficient EuO

M. Barbagallo,<sup>1,\*</sup> T. Stollenwerk,<sup>2</sup> J. Kroha,<sup>2</sup> N.-J. Steinke,<sup>1</sup> N. D. M. Hine,<sup>1,3</sup> J. F. K. Cooper,<sup>1</sup> C. H. W. Barnes,<sup>1,4</sup> A. Ionescu,<sup>1</sup> P. M. D. S. Monteiro,<sup>1</sup> J.-Y. Kim,<sup>1</sup> K. R. A. Ziebeck,<sup>1</sup> C. J. Kinane,<sup>4</sup> R. M. Dalgliesh,<sup>4</sup> T. R. Charlton,<sup>4</sup> and S. Langridge<sup>4</sup>

<sup>1</sup> Cavendish Laboratory, Physics Department, University of Cambridge, Cambridge CB3 0HE, United Kingdom

<sup>2</sup> Physikalisches Institut und Bethe Center for Theoretical Physics, Universität Bonn, D-53115 Bonn, Germany

<sup>3</sup> Thomas Young Centre, Department of Materials and Department of Physics, Imperial College London, Exhibition Road SW7 2AZ, United Kingdom

<sup>4</sup> ISIS, Harwell Science and Innovation Campus, STFC, Oxon OX11 0QX, United Kingdom

(Received 24 May 2011; published 26 August 2011)

We have studied how the magnetic properties of oxygen-deficient EuO sputtered thin films vary as a function of thickness. The magnetic moment, measured by polarized neutron reflectometry, and the Curie temperature are found to decrease with reducing thickness. Our results indicate that these surface-induced effects are caused by the reduced number of nearest neighbors, band bending, and the partial depopulation of the  $4f$  states of Eu.

DOI: 10.1103/PhysRevB.84.075219

PACS number(s): 75.50.Pp, 75.70.Ak, 75.30.Et, 75.60.Jj

### I. INTRODUCTION

Electron-doped EuO is a semiconductor which undergoes a simultaneous ferromagnetic and insulating-conducting phase transition, across which the resistivity drops by 8 to 13 orders of magnitude<sup>1,2</sup> and the conduction electrons become nearly 100% spin polarized,<sup>3,4</sup> making EuO a candidate for efficient spin filtering.<sup>5,6</sup> Electron doping increases the Curie temperature of EuO thin films to above 200 K<sup>7</sup> from 70 K for undoped EuO, and also increases the magnetic moment up to 7.13  $\mu_B$  from the intrinsic value of 7  $\mu_B$ .<sup>8</sup> This is due to the enhanced, conduction-electron-mediated Ruderman-Kittel-Kasuya-Yosida (RKKY) coupling between the Eu  $4f$  spins.<sup>9,10</sup> In thin films and interfaces, these fundamental magnetic properties can also be influenced by additional factors, such as surface-induced modification of the crystalline environment and of the band structure,<sup>10</sup> as well as magnetic proximity effects.<sup>11–13</sup> These interface effects have been studied experimentally mainly in 3d systems, by itinerant ferromagnets<sup>10</sup> or transition metal oxides,<sup>14,15</sup> while interfaces of the  $4f$  compound EuO have only been analyzed theoretically.<sup>16,17</sup>

We have studied systematically the Curie temperature  $T_C(d)$  and magnetic moment per Eu atom,  $m(d)$ , in dependence of the thickness  $d$  of layers of oxygen-deficient EuO<sub>0.96</sub>, interfaced with Pt capping layers. In the thickness range from 2 to 6 nm, we find a systematic reduction of both  $T_C(d)$  and  $m(d)$  with decreasing  $d$ , while our previous investigation in the range from 7 to 12 nm for various oxygen-vacancy concentrations did not show a thickness-dependent variation of these magnetic properties. We find that band bending, the reduced number of nearest neighbors at the interface, and a spatially nonuniform spin-exchange coupling are the primary causes of the thickness dependence of  $T_C(d)$  and  $m(d)$ , due to the increased relative importance of the interface. We are then able to estimate a spatial extension of 9 nm for the effective spin coupling in EuO<sub>0.96</sub>.

This paper is organized as follows. In Sec. II, we describe the growth process and the experimental details of the measurement techniques. Section III discusses the experimental results, in particular the thickness-dependent measurement of the magnetic moment and  $T_C(d)$  of EuO<sub>0.96</sub>.

### II. EXPERIMENTAL METHODS

Thin films of EuO<sub>1-x</sub>, with  $x = 4\%$  were deposited by co-sputtering of Eu<sub>2</sub>O<sub>3</sub> and Eu on Si substrates with a Pt buffer and capping layer of 10 nm each, as described in Ref. 6. The samples were characterized by a superconducting quantum interference device (SQUID), x-ray reflectometry (XRR), and polarized neutron reflectometry (PNR) on the CRISP beamline at ISIS,<sup>18</sup> following the same analysis as carried out in Ref. 6. The accurate determination of the magnetic moment per Eu atom is achieved by fitting the PNR data to a theoretical model with the following parameters: neutron scattering length, neutron absorption, atom number density, fraction of nonmagnetic phases, film thickness, and total magnetic moment of each layer. Except for the latter two, all parameters used to model the data in the present work were found to be the same as for the thicker samples previously measured,<sup>6</sup> indicating a consistent growth process and enabling a direct comparison. This model is explained in detail in Ref. 6.

### III. MAGNETIC MEASUREMENTS OF EuO<sub>0.96</sub>

The PNR data and theoretical fits are shown in Fig. 1, where the reduction in peak spacing and the progressive separation of the spin-up and spin-down curves track the increase in thickness. The samples were polycrystalline and the interlayer roughness was estimated to be about 0.6 nm (rms amplitude).

#### A. Curie temperature

We analyze first the thickness-dependent  $T_C$  for EuO<sub>0.96</sub> in the thickness range between 2 and 40 nm, plotted in Fig. 2 and normalized to the respective bulk value  $T_C^0$ , together with data for EuO taken from Refs. 19 and 20. The reduction of  $T_C(d)$  for stoichiometric, i.e., insulating, EuO can be understood qualitatively by describing the Eu  $4f$  subsystem within a spin  $S = 7/2$  Heisenberg model with an effective nearest-neighbor spin-exchange coupling  $J^2$ . In mean-field theory  $T_C^{\text{MF}} = ZJ/4k_B$ , that is proportional to the number of nearest neighbors  $Z$ , which is reduced from  $Z_0 = 12$  in the

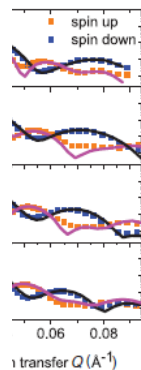


FIG. 1. (Color online) PNR data (data points) and fit (lines) for EuO<sub>0.96</sub> for  $x = 4\%$  (black circles). The data for  $x = 0\%$  (red circles) is taken from Refs. 19 and 20. Above  $x = 4\%$  saturates to 140 K (normalized value of unity, shown). The red curve represents Fig. (1) normalized the largest experimentally considered thickness (10 nm) and blue fit lines are described in the text. The inset shows the magnetization as a function of temperature for a 50 Oe applied field. Each magnetization curve to its own value at 5 K.

band occupation and magnetization. The conduction electrons are an important factor in determining its value is doubled from 70 to 140 K for bulk-like EuO<sub>0.96</sub> compared to EuO.<sup>6</sup> Depletion of the con states at the interface is then likely to be an imp in decreasing  $T_C$ . We can extract an experiment for the range  $\xi$  of the effective spin coupling the experimental data with a phenomenological function,  $T_C/T_C^0 = [\exp(1 - d/\xi) + 1]^{-1}$ , where both the  $T_C$  saturation for large  $d$  and the approximate  $T_C$  suppression for small  $d$ , by a single length best fits yield an effective range of  $\xi \approx 1.2$  nm and  $\xi \approx 9$  nm for  $x = 4\%$  (blue and black fit lines).

We have attempted, but failed, to reproduce the  $T_C$  for EuO<sub>0.96</sub> by performing mean-field calculations layered Heisenberg model with an additional, R effective spin-exchange coupling  $J(z) = J_0 \cos \theta$  off at the thermal length, where  $z$  is the distance spins perpendicular to the interface. We found a for films up to  $d = 40$  nm (not shown) in qualitative agreement. However, it was not possible to fit experimental  $T_C(d)$  curve quantitatively by a spot strength  $J_0$  of the RKKY-induced interaction, like spatially nonuniform modifications in this attribute this to substantial conduction-band bending interfaces, which will be discussed below.

alization to  $T_C^0$  and free of own in Fig. 2 (red curve). We mental  $T_C$  suppression to the st-neighbor couplings are not films. Fluctuations not included increasingly important.

0.96, a simple analysis in terms of the Y exchange interaction. While is an increase in the absolute doped EuO,<sup>9</sup> it also has the lms more susceptible to surface tends up to significantly larger siderations discussed below (in : moment data) indicate band will give a spatially nonuniform

PHYSICAL REVIEW B 84, 075219 (2011)

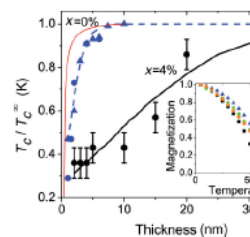


FIG. 2. (Color online)  $T_C(d)/T_C^0$  of EuO<sub>0.96</sub> for  $x = 4\%$  (black circles). The data for  $x = 0\%$  (red circles) is taken from Refs. 19 and 20. Above  $x = 4\%$  saturates to 140 K (normalized value of unity, shown). The red curve represents Fig. (1) normalized the largest experimentally considered thickness (10 nm) and blue fit lines are described in the text. The inset shows the magnetization as a function of temperature for a 50 Oe applied field. Each magnetization curve to its own value at 5 K.

band occupation and magnetization. The conduction electrons are an important factor in determining its value is doubled from 70 to 140 K for bulk-like EuO<sub>0.96</sub> compared to EuO.<sup>6</sup> Depletion of the con states at the interface is then likely to be an imp in decreasing  $T_C$ . We can extract an experiment for the range  $\xi$  of the effective spin coupling the experimental data with a phenomenological function,  $T_C/T_C^0 = [\exp(1 - d/\xi) + 1]^{-1}$ , where both the  $T_C$  saturation for large  $d$  and the approximate  $T_C$  suppression for small  $d$ , by a single length best fits yield an effective range of  $\xi \approx 1.2$  nm and  $\xi \approx 9$  nm for  $x = 4\%$  (blue and black fit lines).

We have attempted, but failed, to reproduce the  $T_C$  for EuO<sub>0.96</sub> by performing mean-field calculations layered Heisenberg model with an additional, R effective spin-exchange coupling  $J(z) = J_0 \cos \theta$  off at the thermal length, where  $z$  is the distance spins perpendicular to the interface. We found a for films up to  $d = 40$  nm (not shown) in qualitative agreement. However, it was not possible to fit experimental  $T_C(d)$  curve quantitatively by a spot strength  $J_0$  of the RKKY-induced interaction, like spatially nonuniform modifications in this attribute this to substantial conduction-band bending interfaces, which will be discussed below.

#### B. Magnetic moment

We analyze now how the layer-averaged magnetic moment varies as a function of thickness. The magnetic Eu atom (measured by PNR at 5 K; cf. Fig. 1) (measured by PNR and XRR) for magnetiza

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

PHYSICAL REVIEW B 84, 075219 (2011)

# Our priorities

- Upload published (derived) data
- Managing permissions
  - Data owner admin features
- Integration with Mantid/analysis process
- (Upgrade from 3.3 to 4.1)



# Questions...



Science & Technology Facilities Council

ISIS