The UKIRT Opportunity

CFHT Users Meeting

8th May 2013

Professor Gary Davis, Director
The UKIRT Opportunity

1. UKIRT and its capabilities
2. Science highlights
3. Facility performance
4. An opportunity for CFHT
Introduction to UKIRT

Vital Statistics:

- first light 1979
- primary diameter 3.8m
- operates exclusively in the infrared
- funded 100% by the United Kingdom
- ongoing collaborations with SNU and KASI
Instrumentation

Previously on UKIRT:

**Wide-Field**
- 75%

**Cassegrain**
- 25%

![Graph showing spectral resolution and wavelength for CGS4 Echelle, UIST Spectroscopy, and UIST Imaging](image)
Instrumentation

From 1st February 2009:

Wide-Field
100%
Telescope Operations

Operational model:

- queue-based, multi-instrument, flexible scheduling
- suite of software tools including data reduction pipelines
- all WFCAM data reduced and archived at CASU (Cambridge) and WFAU (Edinburgh)

Since 2010:

- streamlined science programme
- single instrument
- remote operation from JAC
Cassegrain Science

Imaging

Mars at closest approach

Bailey et al. (2004)
Cassegrain Science

Slit Spectroscopy

**SS433 time series**

*Perez & Blundell (2009)*
Cassegrain Science

Integral Field Spectroscopy

ELAIS N2 850.4
Hα mapping at z=1–2
Swinbank et al. (2005)
Cassegrain Science

Polarimetry

M87 relativistic jet

Cawthorne et al. (unpublished)
Cassegrain Science

Spectropolarimetry

Absorption

Polarisation

ELIAS 16

Hough et al. (2008)
Wide-Field Imaging

WFCAM
4 Hawaii-II arrays
Filters:
ZYJHK, H₂, Brγ
FeII, nbJ, nbH, nbK
Wide-Field Imaging

UFTI
1k x 1k
2.25 sq arcmin

WFCAM
4 x 2k x 2k
745 sq arcmin
Wide-Field Imaging

Orion:

UFTI H2 S(1)

WFCAM J, H, H2 S(1) central portion of one tile
UKIDSS

UKIRT Infrared Deep Sky Survey:

- 7,500 square degrees to minimum depth $K=18.3$
- >3 magnitudes deeper than 2MASS
- originally planned for 1,000 nights over 7 years
- commenced May 2005, last observations Dec 2012
- ESO public survey: data releases every 9mo
- world releases 18mo later
# UKIDSS Survey Design

<table>
<thead>
<tr>
<th>Survey Name</th>
<th>ID</th>
<th>Filters</th>
<th>K limit</th>
<th>Area (sq deg)</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Area Survey</td>
<td>LAS</td>
<td>YJHK</td>
<td>18.4</td>
<td>4000</td>
<td>both</td>
</tr>
<tr>
<td>Galactic Plane Survey</td>
<td>GPS</td>
<td>JHK</td>
<td>19.0</td>
<td>1800</td>
<td>Gal</td>
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<tr>
<td>Galactic Clusters Survey</td>
<td>GCS</td>
<td>ZYJHK</td>
<td>18.7</td>
<td>1600</td>
<td>Gal</td>
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<tr>
<td>Deep Extragalactic Survey</td>
<td>DXS</td>
<td>JK</td>
<td>21.0</td>
<td>35</td>
<td>ExGal</td>
</tr>
<tr>
<td>Ultra Deep Survey</td>
<td>UDS</td>
<td>JHK</td>
<td>23.0</td>
<td>0.77</td>
<td>ExGal</td>
</tr>
</tbody>
</table>

![Graph showing the distribution of surveys across right ascension and declination](chart.png)
# UKIDSS Science Goals

| LAS | • coolest T dwarfs and nearest low-mass dwarfs  
|     | • search for z>6 quasars  
|     | • multi-wavelength photometry of SDSS galaxies  
|     | • detection of cool stars with high proper motions |
| GPS | • creation of a legacy database  
|     | • study of star formation and the ISM  
|     | • search for variables, AGB stars, BDs, PPN, X-ray counterparts  
|     | • complement to Spitzer GLIMPSE |
| GCS | • stellar mass function in the sub-stellar regime  
|     | • establish universality of the IMF |
| DXS | • galaxy clustering at z=1–1.5 to constrain cosmological parameters  
|     | • galaxy clustering at z>1 and evolution of bias  
|     | • multi-wavelength census of luminosity density |
| UDS | • first large-volume map of Universe at z>3  
|     | • growth of structure and bias since z=3  
|     | • determine epoch of spheroid formation |
UKIDSS Highlights

Brown dwarf 520K 4.1pc
Lucas et al. (2010)

Galaxies at z > 6
PI Almaini
UKIDSS Highlights

**Brown dwarf 520K 4.1pc**
Lucas et al. (2010)

**Galaxies at z > 6**
PI Almaini

**First quasar beyond z = 6.4**
Mortlock et al. (2011)

**GRB at z = 8.2**
Tanvir et al. (2009)
A Billion Stars

Data from UKIDSS GPS & VISTA VVV

Data processing at CASU

Science archive at WFAU
UKIRT’s First Planet

WFCAM Transit Survey
6000 M dwarfs in J band
1000 epochs acquired over 5 years
WTS-2b: K star, period 1.02d
RV spectroscopy $\Rightarrow 1.08 M_J$

Cappetta et al. (2012)
Operational Metrics
Operational Metrics

Publications:

![Bar chart showing publications from 1992 to 2012. The number of publications increases significantly from 2010 onwards.](image-url)
Reasons for UKIRT’s Success

- its location: Mauna Kea
- its optical system: mirror and thermal cleanliness
- its instrumentation: aggressive programme to produce leading-edge instruments with unique capabilities
- its software: tools to optimise the observing programme and to produce publication-quality data products
- its staff
Reasons for UKIRT’s Success
Funding Announcement

Decision:

• operational support for UKIRT will cease on 30th September 2013
• operational support for JCMT will cease on 30th September 2014

Options:

• transfer to UH
• transfer to third party
• decommission the facility and restore the site
The Offer

Details:

- telescope, instruments, support equipment, software, staff
- no acquisition cost
- decommissioning liability
Legal Framework

INSTITUTE FOR ASTRONOMY
UNIVERSITY OF HAWAI'I

This could be you

Termination of Sublease

Operational Handover

Facilities Use Agreement

This could be you
Who Wins?

- CFHT community ✔
- CFHT Corporation ✔
- Chinese community ✔
- University of Hawaii ✔
- STFC ✔

Who Loses?

- UKIRT community ×
- Other bidders ×