THE MISSION

AKARI (formerly ASTRO-F) is an infrared survey mission from the Institute of Space and Astronautical Science (ISAS) of the Japan Aerospace Exploration Agency (JAXA) with the participation of the European Space Agency (ESA).

ISAS/JAXA's AKARI (formerly ASTRO-F) Satellite, was launched on 21st February 2006 and is now in its Phase 3 (Post-Helium mission). AKARI performed an all-sky survey in six wavebands between 6 and 180 μm, at higher spatial resolution and larger wavelength coverage than IRAS. The resulting catalogues are expected to contain almost a million sources. Deep imaging and spectroscopic surveys with pointed observations will also be performed in selected areas of the sky. In total, 5000 pointed observations have been executed in the cold phase (Phase 1 & 2).

Launch	February 21st 2006
Orbit	Sun-synchronous polar Altitude: 700 km Period: 100 min
Telescope Diameter	68.5 cm
Wavelength Coverage in cold Phase	*1.8 – 26 μm (IRC)* *50 – 180 μm (FIS)*
Wavelength Coverage in Phase 3	1.8 – 5.5 μm (IRC-NIR)
Cryogenic Lifetime	*550 days*
Post-Helium Phase duration	> 1 year

Focal Plane Configuration:

2 Focal Plane Instruments (13 photometric bands +6 spectroscopy elements)

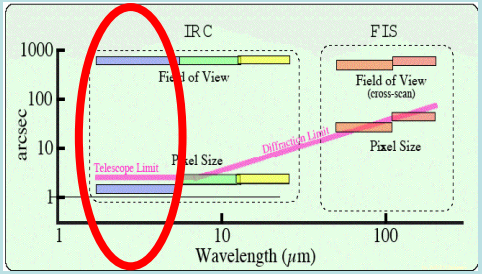
Far Infrared Surveyor (FIS)

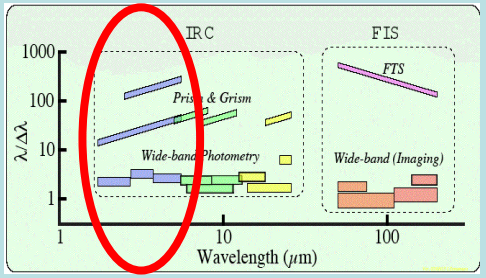
- *4 photometric filters covering 50-180 μm in 2 short & 2 long wavelength bands*
- *Fourier Transform Spectrometer (FTS) covering the range 50-180 μm*
- *The FIS channels share the same sky area*

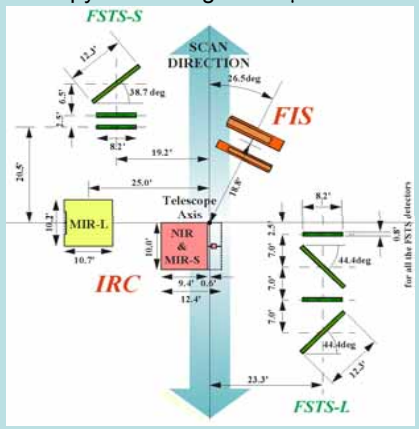
Infrared Camera (IRC)

- 3 Cameras (NIR, MIR-S, MIR-L) x 3 = 9 NIR-MIR bands covering 2-26 μm
- Dispersion elements on cameras for spectroscopy in the range 2-26 μm
- Wide FoV (~10'x10')

Only NIR camera available in Phase 3,
Imaging and spectroscopy capability,
in the 1.8 – 5.5 μm wavelength range

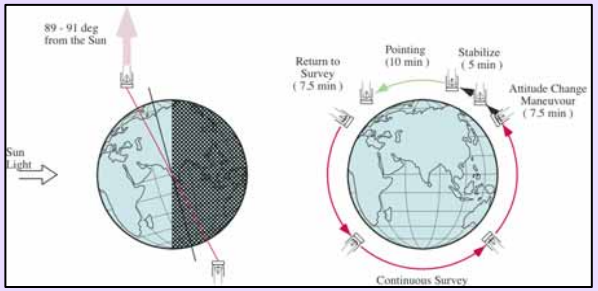


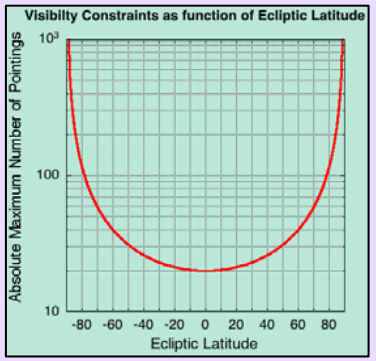




Observation Modes:

AKARI operated either in survey mode or pointed mode. In survey mode, a continuous scan of the sky is performed while the satellite orbits around the Earth. The whole sky is thus covered in half a year. In pointed mode, AKARI stares or scans at a **single** defined target, **for an effective observation time of 10 min**, at a cost of 30 min operation including maneuver and stabilization. The observation parameters are specified in predefined Astronomical Observation Templates (AOTs). One pointed observation corresponds to 1 AOT. **In Phase 3, only pointed observations will be executed.**





Visibility Constraints:

AKARI's orbit is sun-synchronous polar with the telescope always pointed in a plane perpendicular to the Sun, with an **offset control** allowance of only 0.9 degrees. Thus the visibility is a function of ecliptic latitude. Targets near the ecliptic poles are observable on a large number of orbits. Targets on the ecliptic plane are visible only on a limited number of orbits .

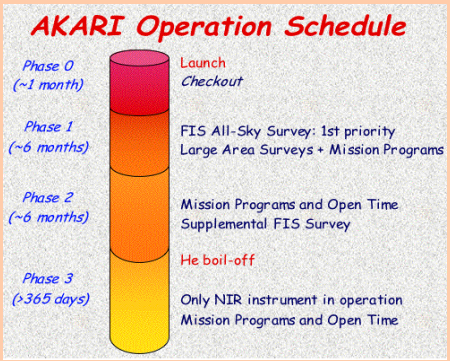
(Figure above shows visibility constraints with offset control of +/- 0.6 degrees and a detector size of 10arcmins. This is the absolute maximum visibility and in reality will be lower)

Visibility Tool http://akari.esac.esa.int/ -- Phase 3 AO page

Mission Phases:

The main objectives of the AKARI Mission are legacy observations in the form of **Large Area Surveys (LS)** and the conduction of large **mission programs (MP)**. A significant phase of the mission is dedicated to pointed observations of astronomical targets. 30% of these opportunities are made available to the general astronomical community as **Open Time (OT)**, via the traditional route of Call for Proposals, followed by peer-review. Resulting from ESA's collaboration in this mission, 10% of the total observing opportunities are open to European users, the other 20% are for Japanese and Korean astronomers. In total, over 2000 Open Time observations are expected to be executed in the first year of Phase 3.

AKARI Operation Schedule



Observers Manual : http://akari.esac.esa.int/ -- Phase 3 AO page
Duplication check tool : http://akari.esac.esa.int/ -- Phase 3 AO page

AKARI Data Products:

Survey Data Products: several catalogues sequentially produced with incremental contents that will become public around one year after they are internally released.

- *All Sky Survey FIS/IRAS Catalogue (Known IRAS Sources Catalogue)*
- *All Sky Survey Bright Source Catalogue (BSC)*
- *All Sky Survey Faint Source Catalogue*

Pointed Legacy Programs: have a one year proprietary period from receipt of data.

- *Large Area Surveys (in cold phase)*
- *Mission Programs (in all phases)*

Phase 2 Open Time Programs: have a one year proprietary period from end of Phase 2.
Phase 3 Open Time Programs: have a one year proprietary period

AKARI Optimized Observations (Recommended):

- Observations that take one ~ few pointings over single/few FoV
- Observations that require multiband coverage without gaps
- Observations at high ecliptic latitudes
- Near-infrared spectroscopy

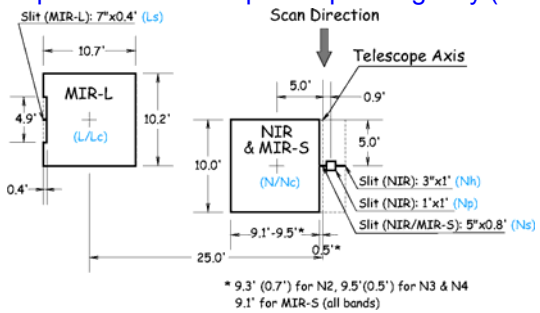
AKARI Non-Optimized Observations (Not Recommended):

- Targets of Opportunity
- Time Critical Observations and chained observations
- Tracking Moving Objects

IRC (NIR)

AKARI (formerly ASTRO-F) is an infrared survey mission from the Institute of Space and Astronautical Science (ISAS) of the Japan Aerospace Exploration Agency (JAXA) with the participation of the European Space Agency (ESA).

The IRC consists of three cameras: NIR, MIR-S and MIR-L. Each camera is equipped with three filters and two dispersion elements. The filters selection can be chosen from a limited number of pre-determined combinations defined in each AOT. In phase 3 (post-Helium mission), only the NIR camera is available for observations. An IRC pointed observation consists of an n times repeated exposure cycle and various operations between them (micro-scan and filter changes). One exposure cycle takes 65.45 sec, during which NIR carries out one short (4.7 sec) and one long (44 sec) exposures.

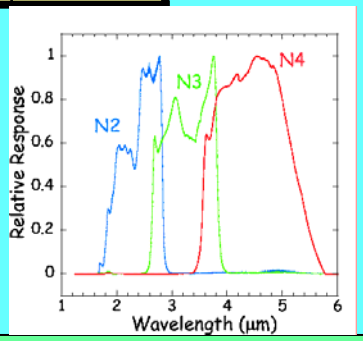


Channel	Image area (pixel^2)	PSF FWHM (pixels)	Pixel size (arcsec^2)
NIR	391x412	3.2	1.46x1.46

In Phase 3, the IRC operates at a temperature of 40K. An increase of hot pixels is observed, compared to operation is the cold Phase. Observers are recommended to perform redundant observations. In imaging AOTs Z2 and Z3, dithering is included.

IMAGING

Filters	λ (μm)
N2	1.9-2.8
N3	2.7-3.8
N4	3.6-5.3



IMAGING AOTs and FILTER SELECTION

AOT	Purpose	Filter	Parameter	Dithering Pos/filter
Z0	Deep imaging	N2 N3 N4	a b c	No
Z2	Imaging with 2 filters	N3 & N4 N3 & NP	a b	3
Z3	Imaging with 3 filters	N2 & N3 & N4	a (fixed)	2

DETECTION LIMITS (5 σ)

AOT Z0

Filter	Point source (μJy)	Extended Source (MJy sr^{-1})
N2	18	0.036
N3	18	0.035
N4	18	0.035

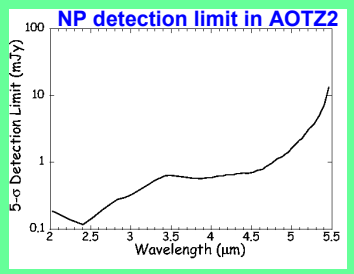
AOT Z2

Filter	Point source (μJy)	Extended Source (MJy sr^{-1})
N3	31	0.061
N4	31	0.061

AOT Z3

Filter	Point source (μJy)	Extended Source (MJy sr^{-1})
N2	39	0.076
N3	39	0.075
N4	38	0.075

NP detection limit in AOTZ2



SATURATION LIMITS

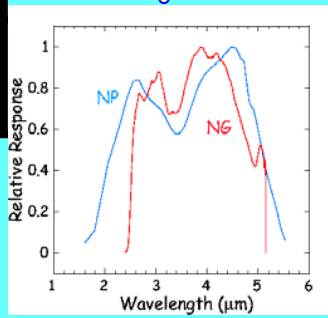
Filter	F_{sat} (Jy)
N2	0.13
N3	0.11
N4	0.07
NP (prism) (AOT Z2)	3

TARGET POSITION

The target position for all imaging AOTs is the center of the NIR camera (N).

SPECTROSCOPY

	λ (μm)	Dispersion (μm/pixel)
NP	1.8-5.5	0.06 @ 3.5μm
NG	2.5-5.0	0.0097

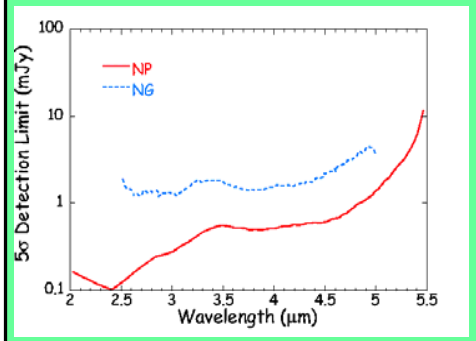


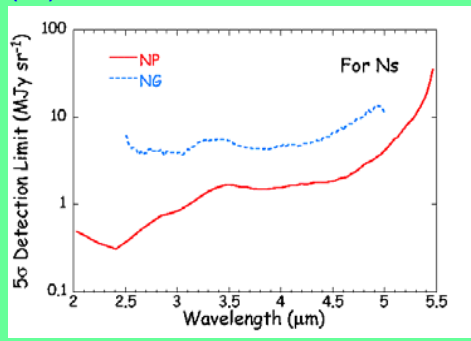
SPECTROSCOPY AOT and DISPERSION ELEMENTS SELECTION

AOT	Disperser	Parameter
Z4	NP NG	a b

A short exposure image with the N3 filter is taken for pointing alignment.

DETECTION LIMITS (5 σ)





5 σ detection limits for point sources, in low sky background regions, assuming 8 exposure cycles in a pointed opportunity (left). 5 σ detection limits for extended sources with the N_s slit in low sky background regions. For the N_h slit, the detection limit is a factor of 5/3 larger (right)

Code	Target position
N_c	Center of the NIR camera (FoV). Recommended for point sources. Both NP or NG can also be used, but be warned about confusion.
N_s	In the 5" slit. Can be used with both NP (prism) and NG (grism)
N_p	In the 1'X1' slit, for point source spectroscopy. Used with NG (grism).
N_h	In the outer, 3" wide slit, used with NG (grism)

SATURATION LIMITS

Disperser	F_{sat} (Jy)
NP	3
NG	10