

HiPStoFITS prototype

(and ideas for SIAP2 and SODA-next)

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How to give access to standard FITS and JPEG images in the age of HiPS ?

Rationale of « classical » images distribution :

- Direct access to non resampled images (original data) for specific science cases
- Comparison with external standard image servers (with same WCS)
- CDS : Follow-ups of previous functionalities for non HiPS clients
 - JPEG thumbnails for CDS portal (replacing Aladin preview..)
 - Local usage for XMM ACDS cross identification pipe-line (originally done with legacy Aladin image server)
- Etc...



How to give access to standard FITS and JPEG images in the age of HiPS ?

- Classical solution : create an image server with original images (VO compliant : ObsTAP, SIAP2.0, SIAP1.0)
 - CDS : VizieR associated images, legacy Aladin server images and others
 - not easily extensible to new collections and virtual data generation
- HiPS-based solution : create images on the fly by reprojecting HiPS pixels on a 2D grid of pixels
 - Already partially operational !!!



Thumbnails generation for CDS Portal -and other purposes- (T.Boch)

- Based on a python code, used in cgi mode
 - See Thomas presentation in « Apps2 » on Friday

The screenshot displays the CDS Portal interface. On the left, a vertical sidebar contains navigation icons. The main content area is divided into two sections. The top section, titled "108 thumbnails (minimum resolution : 7)", shows a grid of 16 thumbnails arranged in 4 rows and 4 columns. Each thumbnail is labeled with its corresponding survey name, such as "CDS/P/PanSTARRS/DR1/color-z-zg-g", "CDS/P/PanSTARRS/DR1/g", "CDS/P/SCUBA/450em", "CDS/P/SCUBA/850em", "CDS/P/SCUBA/850emi", "CDS/P/SPITZER/IRAC1", "CDS/P/SPITZER/IRAC2", "CDS/P/SPITZER/IRAC3", "CDS/P/SPITZER/IRAC4", "CDS/P/SPITZER/MIPS1", "CDS/P/SPITZER/MIPS2", "CDS/P/SPITZER/color", "CDS/P/WISE/WSSA/12um", "CDS/P/allWISE/W1", "CDS/P/allWISE/W2", "CDS/P/allWISE/W3", "CDS/P/allWISE/W4", "CDS/P/allWISE/color", "ESAVO/P/AKARI/N160", and "ESAVO/P/AKARI/N60". The bottom section shows a large view of a galaxy, labeled "S colored", with a zoom level of "2000" and coordinates "RA 04 52.032 -00 09 13.2". Below the galaxy view, there are buttons for "Share", "Thumbnails", and "Update".

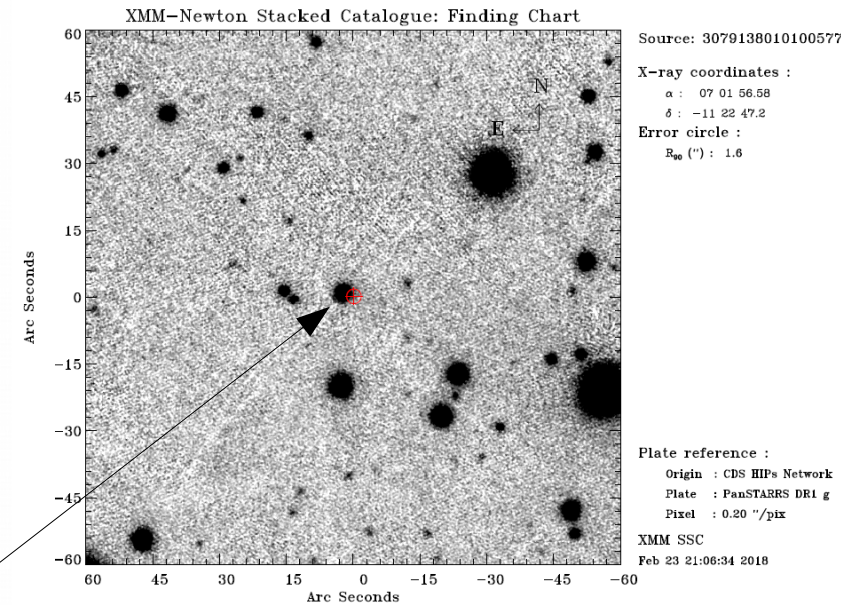
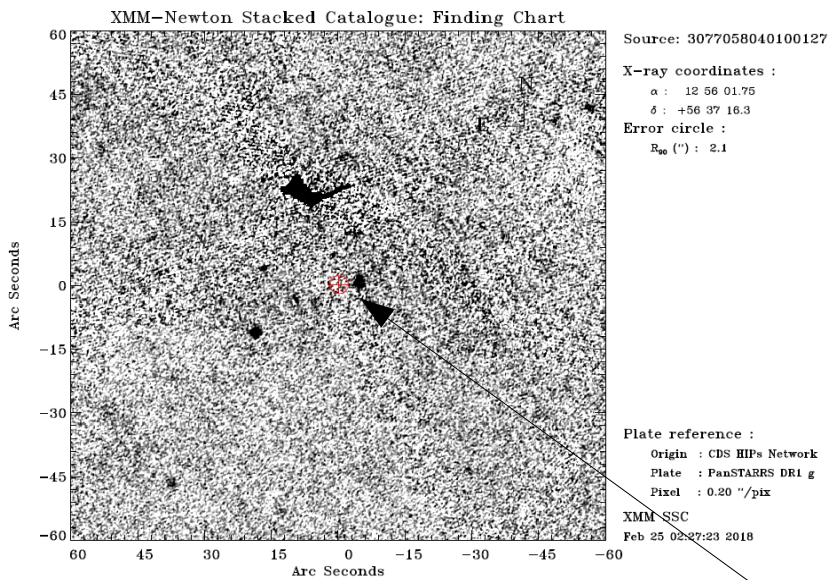


HiPStoFITS for XMM ACDS (Laurent Michel + Pierre Fernique)

- Based on an extension of Aladin java code
 - Generates FITS images from HiPS for a preselected list of HiPS
 - TAN projection
 - Web Server = servlet technolog.
 - Works for any spatial extent by adapting resolution
- Operational in SSC XMM since 2018 January
 - Image Quality well received by ACDS astronomers
 - Reused by other SSC partners (eg Pan-Starrs finding charts for Stacked XMM catalog)



HiPStoFITS for XMM ACDS (Laurent Michel)



XMM source

Pan-Starrs finding charts for Stacked XMM Catalogue (3XMMdr7s catalogue, Iris Traulsen et al. A&A submitted)



HiPStoFITS version 2 : extended functionalities (Chaitra)

- All WCS projections available
- More flexibility in the interface parameters
(Polygon, Circle, resolution...)
- Force output via WCS
- HiPStoFITS becomes a testbed fo IVOA protocol
prototype for virtual data generation (« SODA »)
- Integration of HiPStoFITS in CDS SIAP-2 interface
(virtual image server combined with archived standalone
images)



Access to DSS2 red image generated by hipstofits with position, size and resolution selected by the user through a dedicated html interface

Image Maker V2

Survey: DSS2 red

Cutout constraints:

Direct input

Consider the bounding box around this target area

Order: 9

Resolution (arcsec): 0.4

Other parameters:

Projection: Tangential

Rotation: 0

WCS params

to DS9 to SAMP

<http://localhost:8080/hipstofits/getfitsV2?surveyurl=http%3A%2F%2Falasky.u-strasbg.fr%2FDSS%2FDSS2Merged&positionType=direct&pos=Circle%20308.72%20%2B60.15%200.5&resType=order&order=9&projection=Tangential&rotation=0.0>

<http://localhost:8080/hipstofits/getfitsV2?surveyurl=http%3A%2F%2Falasky.u-strasbg.fr%2FDSS%2FDSS2Merged&positionType=direct&pos=Circle%20308.72%20%2B60.15%200.5&resType=order&order=9&projection=Tangential&rotation=0.0>

<http://localhost:8080/hipstofits/getfitsV2?surveyurl=http%3A%2F%2Falasky.u-strasbg.fr%2FDSS%2FDSS2Merged&positionType=direct&pos=Circle%20308.72%20%2B60.15%200.5&resType=order&order=9&projection=Tangential&rotation=0.0>

File View Zoom Scale Color Regions WCS Analysis Help

1922.360 20:35:12.695 +60:40:54.30 (FK5) 410.000 666.000 (physical)



Same interface, Pan-STARRS, driven by WCS header

Survey **Pan STARRS g** ▾

Cutout constraints:

Direct input


WCS params

```
NAXIS1 = 893
NAXIS2 = 894
CRPIX1 = 428.64075008849613
CRPIX2 = 429.3906615923661
EQUINOX = 2000.0
CRVAL1 = 308.75
CRVAL2 = +60.15
CTYPE1 = RA---AIT
CTYPE2 = DEC--AIT
RADECSYS= FK5
CD1_1 = -2.2397357222844153E-4
CD1_2 = -0.0
CD2_1 = -0.0
CD2_2 = 2.2397357222844153E-4
```

```
http://localhost:8888/hipstofits//getfitsV2?surveyurl=http%3A%2F%2Falasky.u-strasbg.fr%2FPan-STARRS%2FDR1%2Fg&positionType=direct&pos=Circle%20308.72%20%2060.15%200.07&resType=spatres&spatres=1&projection=Cartesian&rotation=0.0
http://localhost:8888/hipstofits//getfitsV2?surveyurl=http%3A%2F%2Falasky.u-strasbg.fr%2FPan-STARRS%2FDR1%2Fg&positionType=direct&pos=Circle%20308.72%20%2060.15%200.08&resType=spatres&spatres=1&projection=Cartesian&rotation=0.0
http://localhost:8888/hipstofits//getfitsV2?surveyurl=http%3A%2F%2Falasky.u-strasbg.fr%2FPan-STARRS%2FDR1%2Fg&positionType=direct&pos=Circle%20308.72%20%2060.15%200.09&resType=spatres&spatres=1&projection=Cartesian&rotation=0.0
```

File View Zoom Scale Color Regions WCS Analysis Help

-0.2 20:34:08.296 +60:07:00.26 (FK5) 891.000 265.000 (physical)



Proposal for SODA-next interface reconsidering parameters

- Proposal based on HiPStoFITS experience
 - Non spatial parameters as in SODA1.0 (selection on the axis)
 - ID = may be an image identifier or a HiPS identifier/url
 - POS = as in SODA1.0 .
 - SPATRES = spatial resolution (or HiPS order as non standard parameter)
 - PROJECTION = sky projection
 - PA = position angle of the North direction
- OR alternatively to above
 - WCS = wcs fits header keywords list
- BOUNDS = TRUE/FALSE
 - bounding box of the shape / exact shape



Proposal for SODA-next interface discovery and access (FB developments)

- Can be accessed in several ways :
 - direct URL in SIAP2.0 consistent with SIAP2.0 Parameters (POS, SPATRES, etc ...)
 - Or via DataLink and a dedicated interface
 - Next slides → Aladin GLU interface
 - Retrieved images could be stored or sent to another application via SAMP



Mode 1 :SIAP2 interface through Aladin GLU menu and query response showing links to dynamically generated HiPStoFITS url

The screenshot displays the Aladin GLU interface. At the top, the menu includes File, Edit, Image, Catalog, Overlay, Coverage, Tool, View, Interop, and Help. The main window shows a star field with a central galaxy. A 'Server selector' dialog box is open, showing the 'HIPS CDS SIAP2 virtual data prototype' selected. The dialog contains the following fields:

- POS: 308.72 60.15 0.1
- BAND: (empty)
- TIME: (empty)
- FORMAT: application/fits
- RESPONSEFORMAT: VOTable

Buttons at the bottom of the dialog include Reset, Clear, SUBMIT, and Close. Below the dialog, a table of query results is visible:

access url	dataproduc...	calib level	obs collecti...	obs id	obs publisher ...	access format	access estsize	target name	s ra	s d
http://localhost	image	1	PLANCK R2 HFI...	CDS/P/PLANCK/R2	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PLANCK R2 HFI...	CDS/P/PLANCK/R2	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PLANCK R2 LFI...	CDS/P/PLANCK/R2	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PLANCK R2 LFI...	CDS/P/PLANCK/R2	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PLANCK R2 LFI...	CDS/P/PLANCK/R2	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PanSTARRS DR...	CDS/P/PanSTARRS	ivo://CDS/P/PanS	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HFI 100	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HFI 143	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HFI 143	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HFI 217	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HFI 545	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HFI 857	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck LFI 30	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck LFI 44	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck LFI 44 s...	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck LFI 70	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck LFI 70 s...	ESA/VO/P/PLANCK	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	

The interface also features a 'Server selector' dialog box with tabs for 'Others', 'File', 'FoV...', 'HIPS', and 'Tools...'. The 'HIPS' tab is active, showing the 'HIPS CDS SIAP2 virtual data prototype' selected. The dialog includes fields for 'POS', 'BAND', 'TIME', 'FORMAT', and 'RESPONSEFORMAT', along with 'Reset', 'Clear', 'SUBMIT', and 'Close' buttons.

Mode 1 :SIAP2 Obscore metadata for hipsfits virtual images

DSS2 color 20:29:27.85 +60:27:44.1

Imagine your eye
HIPS-CDS SIAP2
CDS/P/DSS2/c

Obs_publisherid
Spatial characterization, etc..

stn	obs id	obs_publisherid	access format	access estsize	target name	s ra	s dec	s fov	s region	s resolution	s xel1	s xel2	em mil
1	ov-gso/P/GAURIBIDANUR # 308.72 60.15 0.1	ivo://ov-gso/P/GAURIBIDANUR	image/fits	-32768		308.72000000	60.1499999999	0.100000000000		51.5159999999	6	6	8.68999999
1	ov-gso/P/IRIS/1 # 308.72 60.15 0.1	ivo://ov-gso/P/IRIS/1	image/fits	-32768		308.72000000	60.1499999999	0.100000000000		51.5159999999	6	6	1.2
2	ov-gso/P/IRIS/2 # 308.72 60.15 0.1	ivo://ov-gso/P/IRIS/2	image/fits	-32768		308.72000000	60.1499999999	0.100000000000		51.5159999999	6	6	2.50000000
6	ov-gso/P/IRIS/3 # 308.72 60.15 0.1	ivo://ov-gso/P/IRIS/3	image/fits	-32768		308.72000000	60.1499999999	0.100000000000		51.5159999999	6	6	6.00000000
1	ov-gso/P/IRIS/4 # 308.72 60.15 0.1	ivo://ov-gso/P/IRIS/4	image/fits	-32768		308.72000000	60.1499999999	0.100000000000		51.5159999999	6	6	0.1
1	ov-gso/P/IRIS/5 # 308.72 60.15 0.1	ivo://ov-gso/P/IRIS/5	image/fits	-32768		308.72000000	60.1499999999	0.100000000000		51.5159999999	6	6	6.00000000

15' 1.855° x 1.056°

Mode 1 : SIAP2 HiPStoFITS Pan-STARRS retrieved image

Aladin v10.0 *** BETA VERSION (based on v10.098) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Command: 20:34:52.80000 +60:09:00.0000

Frame: ICRS Projection: Aitoff

Available data → 22055 / 22059

Server selector

Image servers: Aladin Images, SkyView, Sloan, DSS..., VLAA..., Se..., Others...

Catalog servers: All VizieR, SIMBAD, TAP, Gaia, SkyBot, VO, Others...

HIPS CDS SIAv2 virtual data prototype

Fill in all these fields and press the SUBMIT button

POS: 308.72 60.15 0.1

BAND: []

TIME: []

FORMAT: application/fits

RESPONSEFORMAT: VOTable

Buttons: Reset, Clear, SUBMIT, Close

Selected image

access url	dataproduc...	calib level	obs collecti...	obs id	obs publisher ...	access format	access estsize	target name	s ra	s d
http://localhost	image	1	PLANCK R2 HF1...	CDS/P/PLANCK/R2...	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PLANCK R2 HF1...	CDS/P/PLANCK/R2...	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PLANCK R2 HF1...	CDS/P/PLANCK/R2...	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PLANCK R2 HF1...	CDS/P/PLANCK/R2...	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PLANCK R2 LF1...	CDS/P/PLANCK/R2...	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PLANCK R2 LF1...	CDS/P/PLANCK/R2...	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PLANCK R2 LF1...	CDS/P/PLANCK/R2...	ivo://CDS/P/PLANCK	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	PanSTARRS DR...	CDS/P/PanSTARR...	ivo://CDS/P/PanS	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HF1 100	ESA/VO/P/PLANCK...	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HF1 143	ESA/VO/P/PLANCK...	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HF1 143	ESA/VO/P/PLANCK...	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HF1 217	ESA/VO/P/PLANCK...	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HF1 545	ESA/VO/P/PLANCK...	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	
http://localhost	image	1	Planck HF1 657	ESA/VO/P/PLANCK...	ivo://ESA/VO/P/PL	image/fits	-32768	308.72000000...	60.1499	

Search

epoch - [] size - [] dens. - [] opac. - [] zoom - []

20:34:52.66749 +60

16.04' x 8.658'

Mode 2 : Access to 2MASS K image with position, size and resolution selected by the user through Aladin GLU menu

The screenshot displays the Aladin v10.0 software interface. The main window shows a 2MASS K image of a star field. A dialog box titled "Server selector" is open, showing the "HPSFits" section. The "HIPS" field is set to "2MASS/K". The "RA" field is set to "308.72", "DEC" to "60.15", "RADIUS (deg)" to "0.05", and "SPATRES (arcsec)" to "0.4". The "SUBMIT" button is highlighted. The interface includes a menu bar (File, Edit, Image, Catalog, Overlay, Coverage, Tool, View, Interop, Help), a command line, and various toolbars. The status bar at the bottom shows "0 sel / 280 src" and "383Mb".

Aladin v10.0 *** BETA VERSION (based on v10.073) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 22055 / 22059
in view out view

Command 20:35:08.23 +60:08:32.9

DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Gaia Simbad NED +

HPSFits 2MASS/K

Server selector

Others File FileV... HiPS Tools...

Image servers

Aladin images

HPSFits

Fill in all these fields and press the SUBMIT button

HIPS	2MASS/K
RA	308.72
DEC	60.15
RADIUS (deg)	0.05
SPATRES (arcsec)	0.4

Reset Clear SUBMIT Close ?

Catalog servers

All VizieR

Simbad

ALICE PAIR TAP

Gaia

SkyBot

NED

YO

Others..

select

from --all collections--

exp. sort view scan filter

epoch size dens. opac. zoom

7.967" x 5.787"

Search

0 sel / 280 src 383Mb

Mode 2 : Switching to 2MASS H

Aladin v10.0 *** BETA VERSION (based on v10.073) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 22055 / 22059
● in view ● out view

Command [] Frame [CRS] Projection [Aitoff]

● DSS ● SDSS ● 2MASS ● WISE ● GALEX ● PLANCK ● AKARI ● XMM ● Fermi ● Gaia ● Simbad ● NED +

HPSFits 2MASS/H

Server selector

Others File FileV... HiPS Tools...

Image servers

- Aladin images
- HPSFits
- SkyView
- Sloan
- DSS...
- VIA...
- Archives...
- Others...

Catalog servers

- All VizieR
- Simbad
- TAP
- Gaia
- SkyBot
- NED
- O
- Others..

Fill in all these fields and press the SUBMIT button

HIPS	2MASS/H
RA	308.72
DEC	60.15
RADIUS (deg)	0.05
SPATRES (arcsec)	0.4

Reset Clear SUBMIT Close ?

select [] from --all collections--

exp. sort view scan filter

7.967° x 5.787°

Search []

0 sel / 280 src 234Mb

ALADIN

Tips & tricks

Pixel mapping controller

Tip: The pixel mapping may be adjusted directly in the main panel thanks to a clic&drag action with the right-mouse button. The mouse pointer position determines the contrast and the luminosity of the view (a la "DS9").

Also, the usage of the hdr button in the main panel allows you to switch from the preview mode (256 levels) to the full dynamic mode offering the full dynamicity of the image.

Ok

HIPS-CDS SIAV2

HPSFits 2MASS/H

CDS/P/DSS2/c

epoch - [] +

size - [] +

dens. - [] +

opac. - [] +

zoom - [] +

6" x 6"

Mode 2 : Switching to GALEX and enlarging the size to 1 deg

The screenshot displays the Aladin v10.0 software interface. The main window shows a star field visualization with a central star highlighted by a red crosshair. The interface includes a menu bar (File, Edit, Image, Catalog, Overlay, Coverage, Tool, View, Interop, Help), a toolbar, and a sidebar with various tool icons. A 'Server selector' dialog box is open, showing a table of fields to be filled for the 'SODA HIPStoFITS Aladin Server'. The table contains the following data:

Field	Value
RA	308.72
DEC	60.15
RADIUS (deg)	1.0
SPATRES (arcsec)	11.0

The dialog box also includes a 'SUBMIT' button and a 'Close' button. The main window shows the 'Available data' section with '22055 / 22059' items, and the 'Command' field contains 'HPSFits GALEX/GR6-03-2014/AIS-ND-1'. The 'Frame' is set to 'CRS' and the 'Projection' is 'Aitoff'. The status bar at the bottom indicates the coordinates '3.654° x 2.654°' and the zoom level '24° x 24°'.

HiPStoFITS version 2 and SIAP2 next steps

- Finalize code
- Release SIAP2 and HiPStoFITS external access next year (before next interop)
- IVOA : Propose the HipsToFits interface for virtual data « SODA-next » protocol and SIAP2.x virtual data generation option

