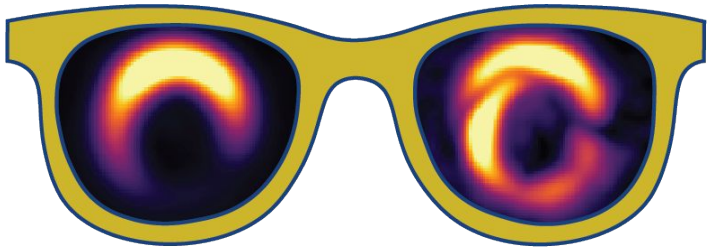
Live Demo of
Full Polarization ALMA Archive Data

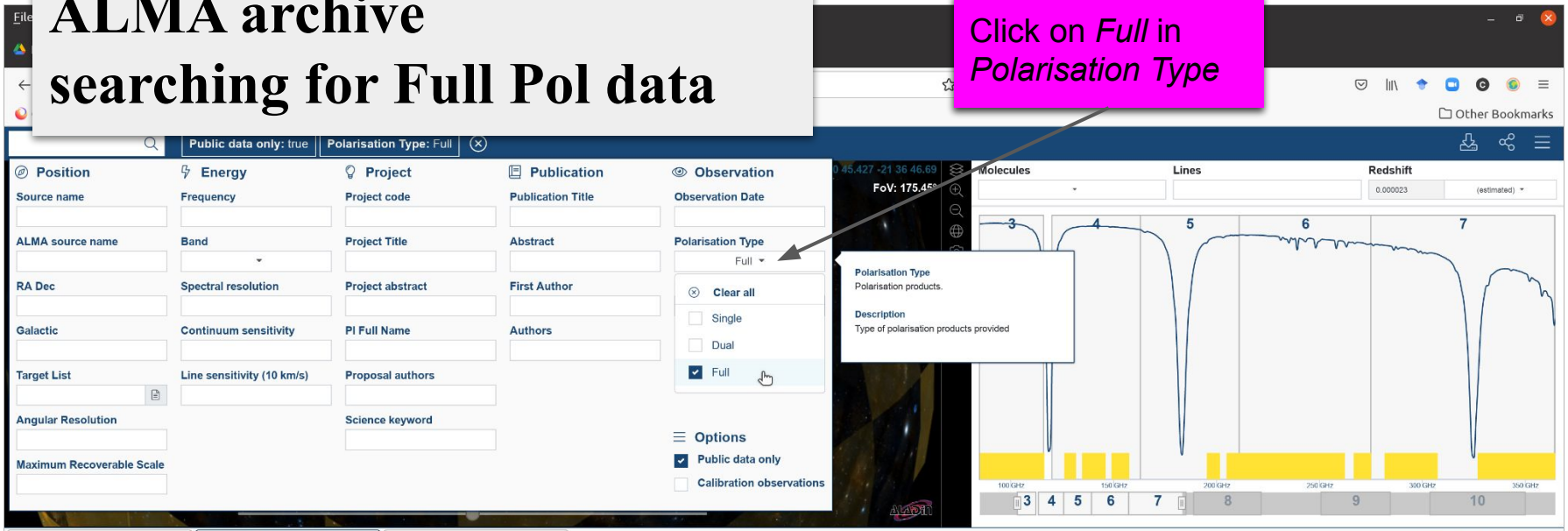
Tutorial for exploring & working with Full-Pol data using CARTA with ALMA archive



I-TRAIN #7 Polarization observations with ALMA
European ARC Network, June 24, 2021

ALMA archive searching for Full Pol data

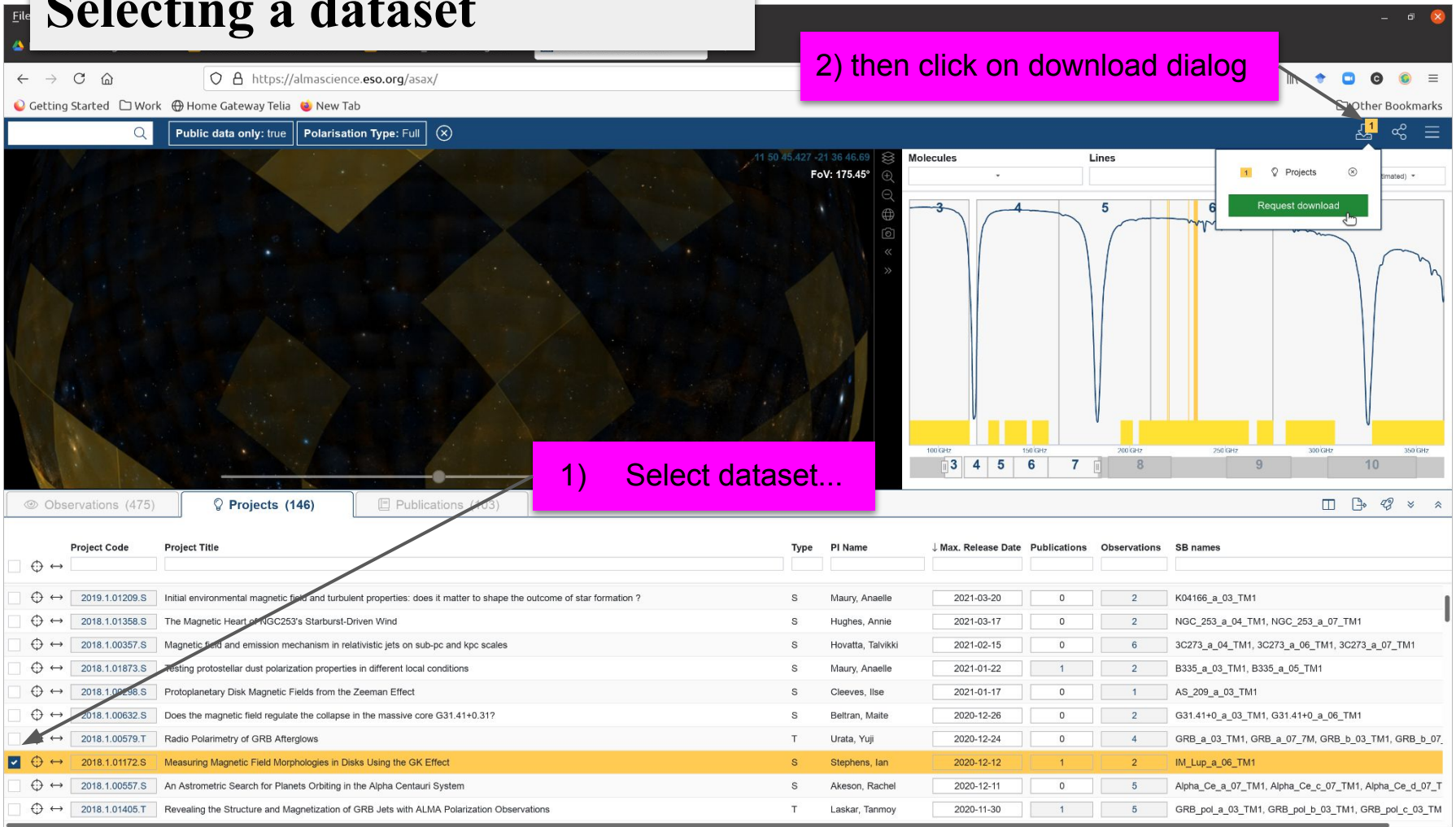
Click on *Full* in *Polarisation Type*



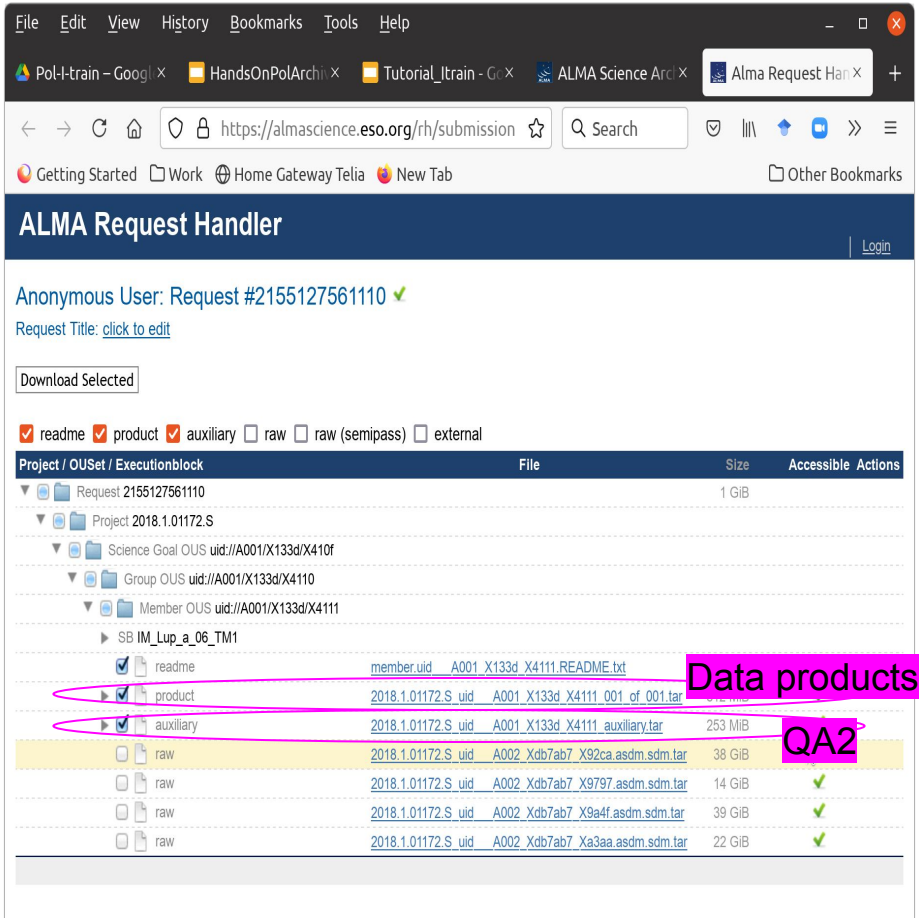
Observations (475) | Projects (146) | Publications (103)

Project Code	Project Title	Type	PI Name	↑ Max. Release Date	Publications	Observations	SB names
2011.0.00017.SV	Science verification observation of 3C 286	SV	observatory, ALMA	2016-06-24	2	1	3c286 b6 Session ON query 1hr
2013.1.00725.S	Interferometric mapping of magnetic fields in the W43 mini-starburst	S	Cortes, Paulo	2016-10-28	2	7	W43-MM8_a_06_TE
2013.1.00355.S	The Morphology of the Magnetic Field of HL Tau	S	Stephens, Ian	2016-10-29	0	1	HL_Tau_a_07_TE
2013.1.00286.S	Particle acceleration and magnetic field in the hot spot of 3C 445	S	Orienti, Monica	2016-12-20	1	1	3C_445_a_03_TE
2013.1.00116.S	How Strongly are the 2 Known Class 0 Disks Magnetized?	S	Looney, Leslie	2017-01-25	0	1	L1527-mm_a_07_TE
2013.1.00053.S	A search for the elusive sub-mm polarisation in protostellar disks	S	Pinte, Christophe	2017-02-05	0	1	HD163296_a_07_TE
2013.1.00726.S	Probing magnetic fields in the inner envelopes of Class 0 protostars via dust polarization	S	Hull, Charles	2017-02-06	6	9	Serpens__a_06_TC, Serpens__a_06_TE, Serpens__a_07_12
2013.1.00254.S	A Comprehensive View of Magnetic Fields around Young Protostar NGC 1333 IRAS 4A	S	Lai, Shih-Ping	2017-03-08	0	1	iras4a_a_07_TC
2013.1.00231.S	Revealing Magnetic Field Structures: Intermediate-mass Prestellar and Protostellar Cores in OMC-3	S	Takahashi, Satoko	2017-03-14	0	7	MMS1_a_07_TE, MMS3_a_07_TE
2015.1.01170.S	Mass accretion onto the Super Massive Black Hole of M 87	S	Asada, Keiichi	2017-03-25	2	1	M87_a_03_TE

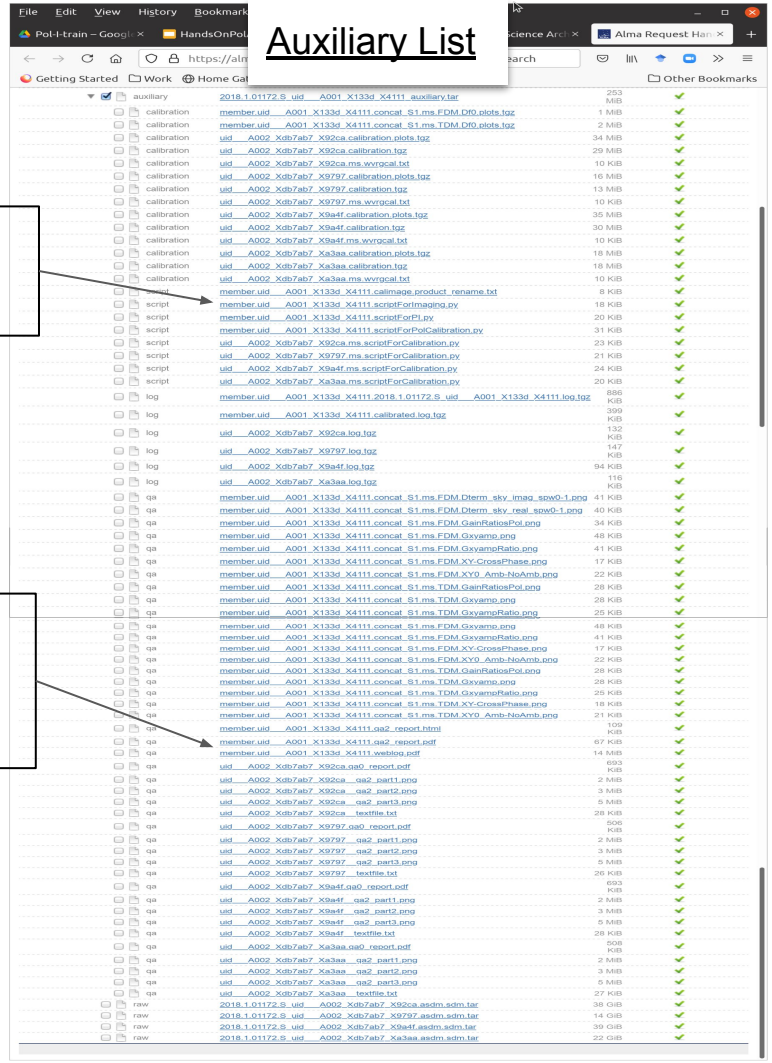
Selecting a dataset



Data Request Handler



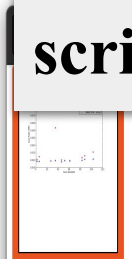
Auxiliary List

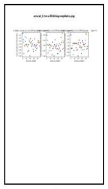


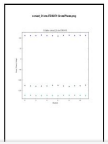
Imaging script

Weblog (quality metrics)

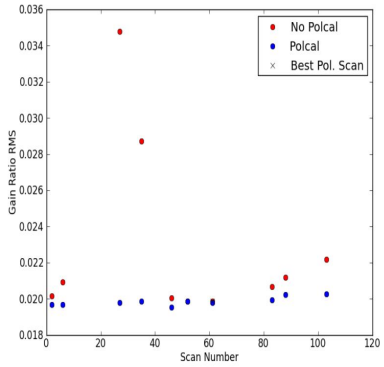
Examine weblog report and scripts







concat_S1.ms.FDM.GainRatiosPol.png



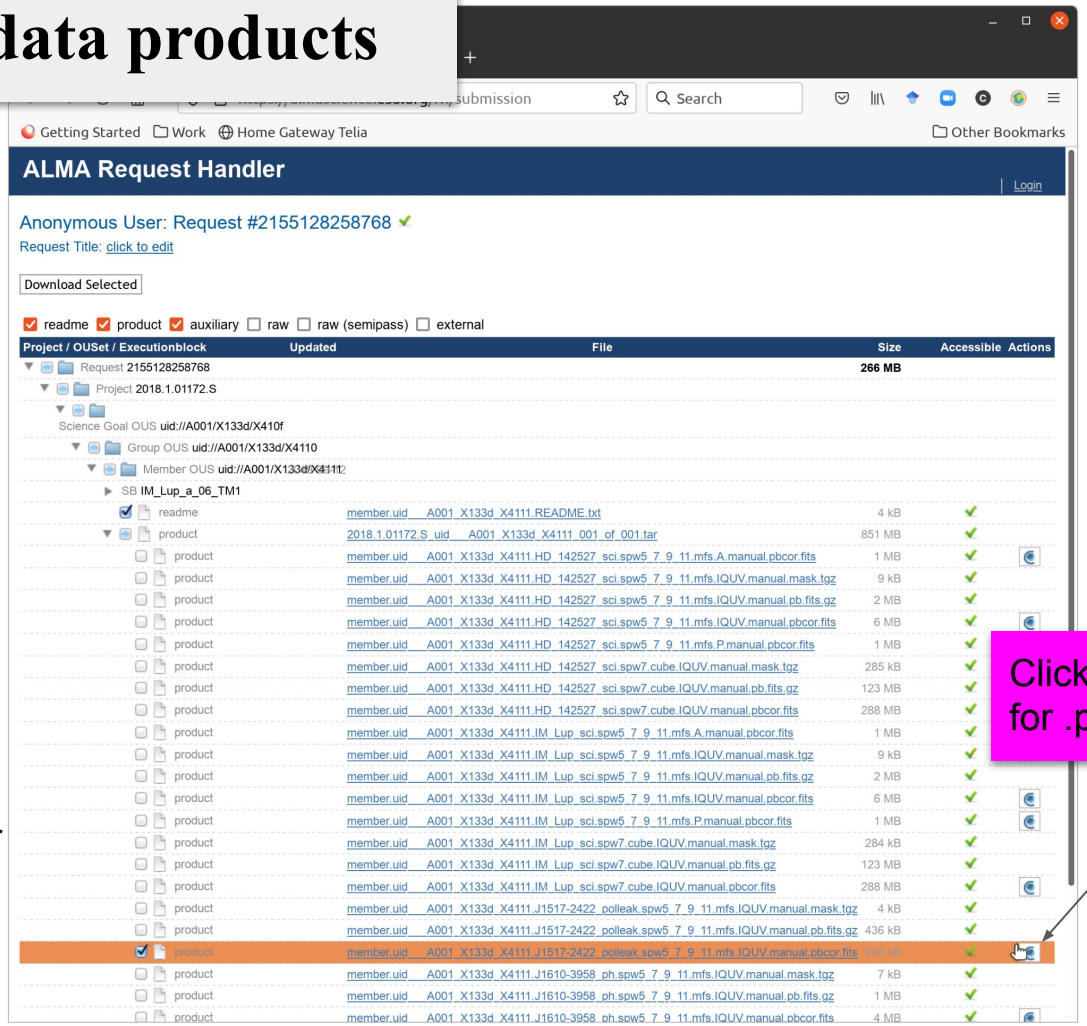
Open | member.uid___A001_X133d_X4111.scriptForImaging.py [Read-Only] /tmp/mozilla_tobia0 | Save

```
1  # ALMA Data Reduction Script
2  # $Id: scriptForImaging_FullPolTemplate.py,v 1.3 2019/06/25 11:23:40 dpetry Exp $
3
4  # Imaging
5
6  thesteps = []
7  step_title = {0: 'Stokes cleaned images of Polarization calibrator',
8                1: 'Stokes images of Phase calibrator (optional)',
9                2: 'IQUV continuum image of the target',
10               3: 'Continuum subtraction',
11               4: 'IQUV cube image at rep freq',
12               5: 'Polarization images production',
13               6: 'Export images to FITS format'}
14
15 if 'applyonly' not in globals(): applyonly = False
16 try:
17   print 'List of steps to be executed ...', mysteps
18   thesteps = mysteps
19 except:
20   print 'global variable mysteps not set.'
21 if (thesteps==[]):
22   thesteps = range(0,len(step_title))
23   print 'Executing all steps: ', thesteps
24
25 # The Python variable 'mysteps' will control which steps
26 # are executed when you start the script using
27 #   execfile('scriptForCalibration.py')
28 # e.g. setting
29 #   mysteps = [2,3,4]# before starting the script will make the script execute
30 # only steps 2, 3, and 4
31 # Setting mysteps = [] will make it execute all steps.
32
33
34 thevis = 'concat.ms.cal'
35
36 phasecal = '2'
37 phasecalname = 'J1610-3958'
38 polcal = '0'
39 polcalname = 'J1517-2422'
40 target1 = 'IM_Lup'
41 target2 = 'HD_142527'
42
43 originalSPWIDs = '5_7_9_11'
44
45
46 # Stokes images for target Polarization calibrator
47 mystep = 0
48 if(mystep in thesteps):
49   casalog.post('Step '+str(mystep)+' '+step_title[mystep],'INFO')
50   print 'Step ', mystep, step_title[mystep]
51
52   os.system('rm -rf '+polcalname+'_polleak.spw'+originalSPWIDs+'.mfs.IQUV.manual*')
53   tclean(vis = thevis,
54          imagename = polcalname+'_polleak.spw'+originalSPWIDs+'.mfs.IQUV.manual',
```

Python | Tab Width: 8 | Ln 394, Col 40 | INS

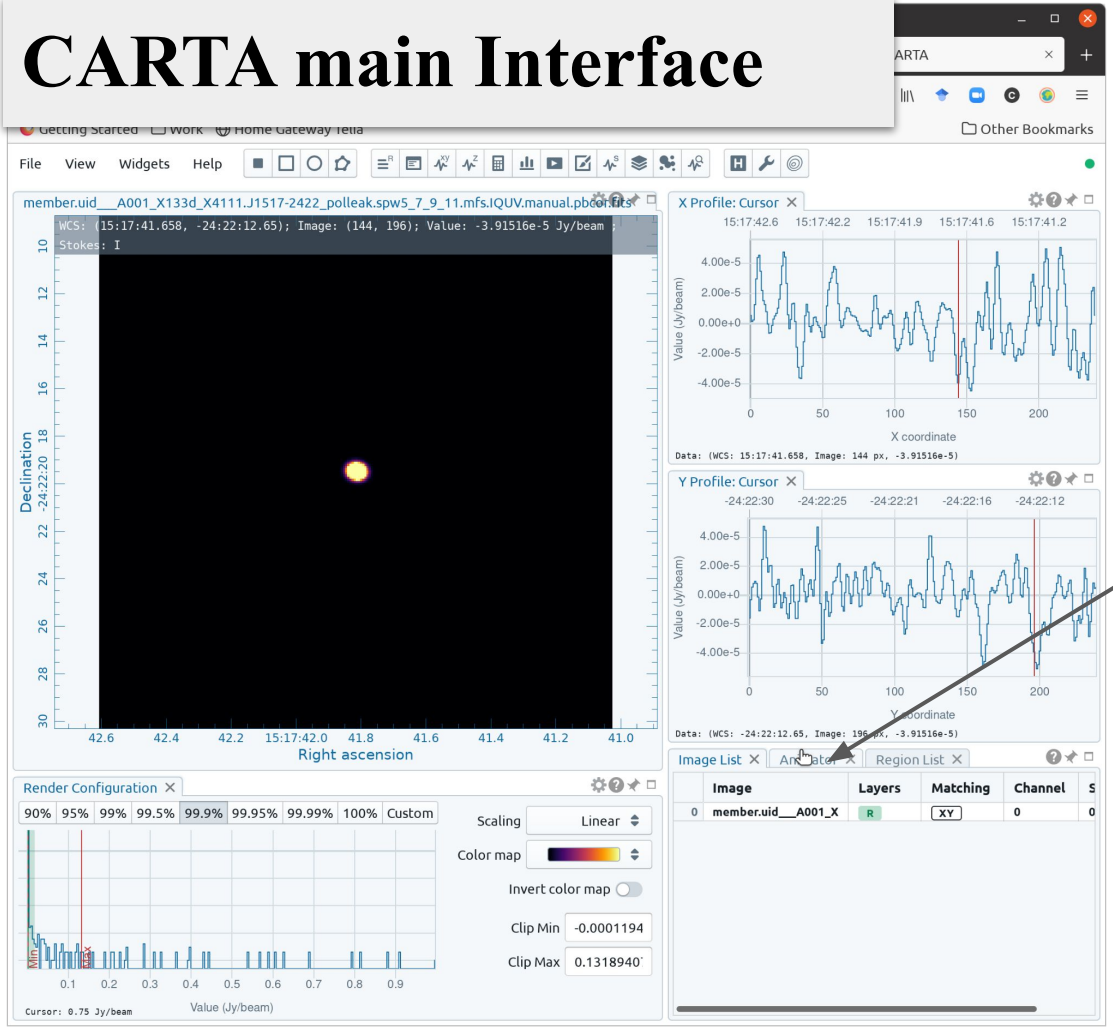
Browsing Pol data products

- Polarization Params
  - Stokes I,Q,U,V
  - Angle A
  - LinPol P
- Spectral
  - MFS
  - Cube
- Targets
  - HD_142537
  - IM_Lup
  - polleak=PolCalibr



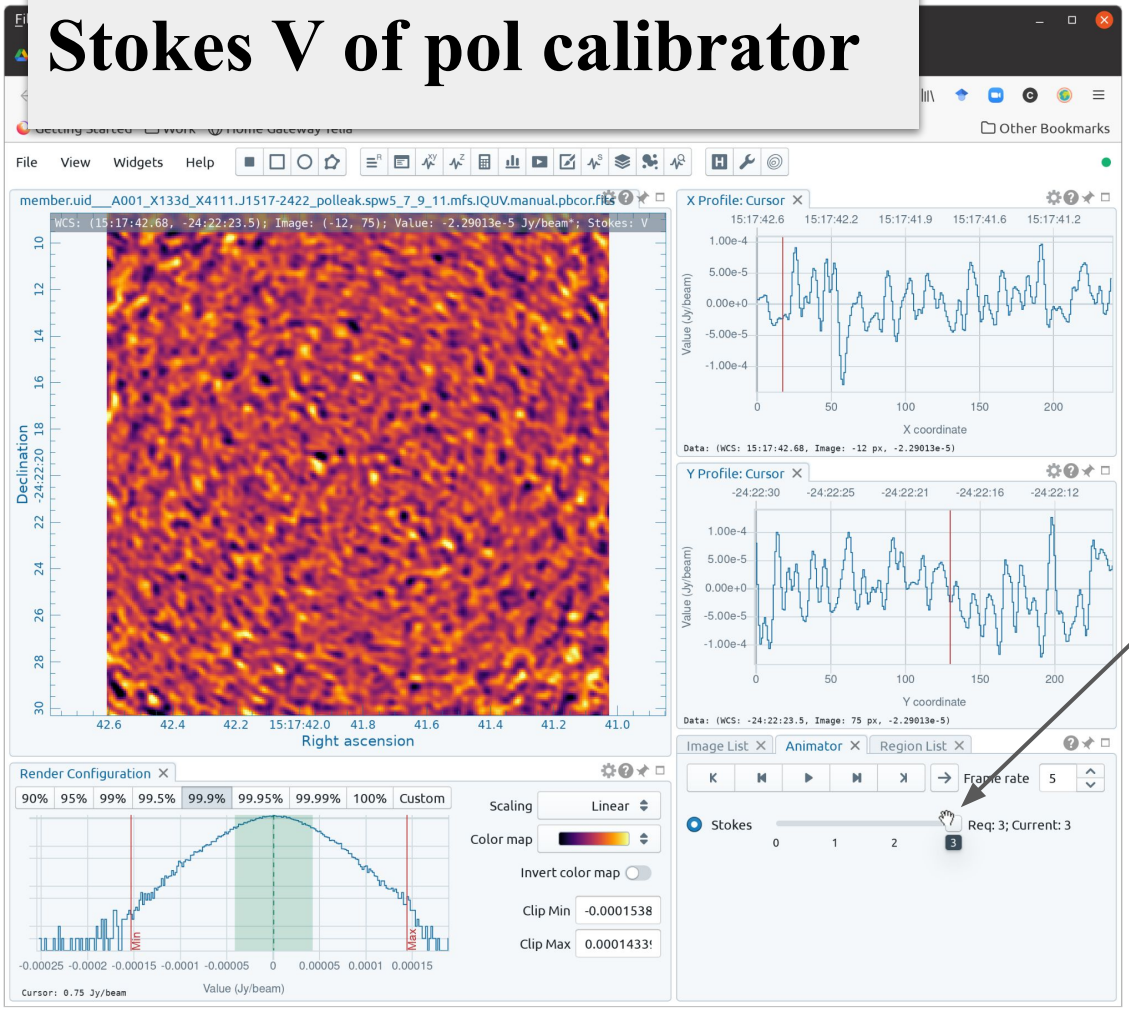
Click on CARTA button for .polleak. FITS

CARTA main Interface



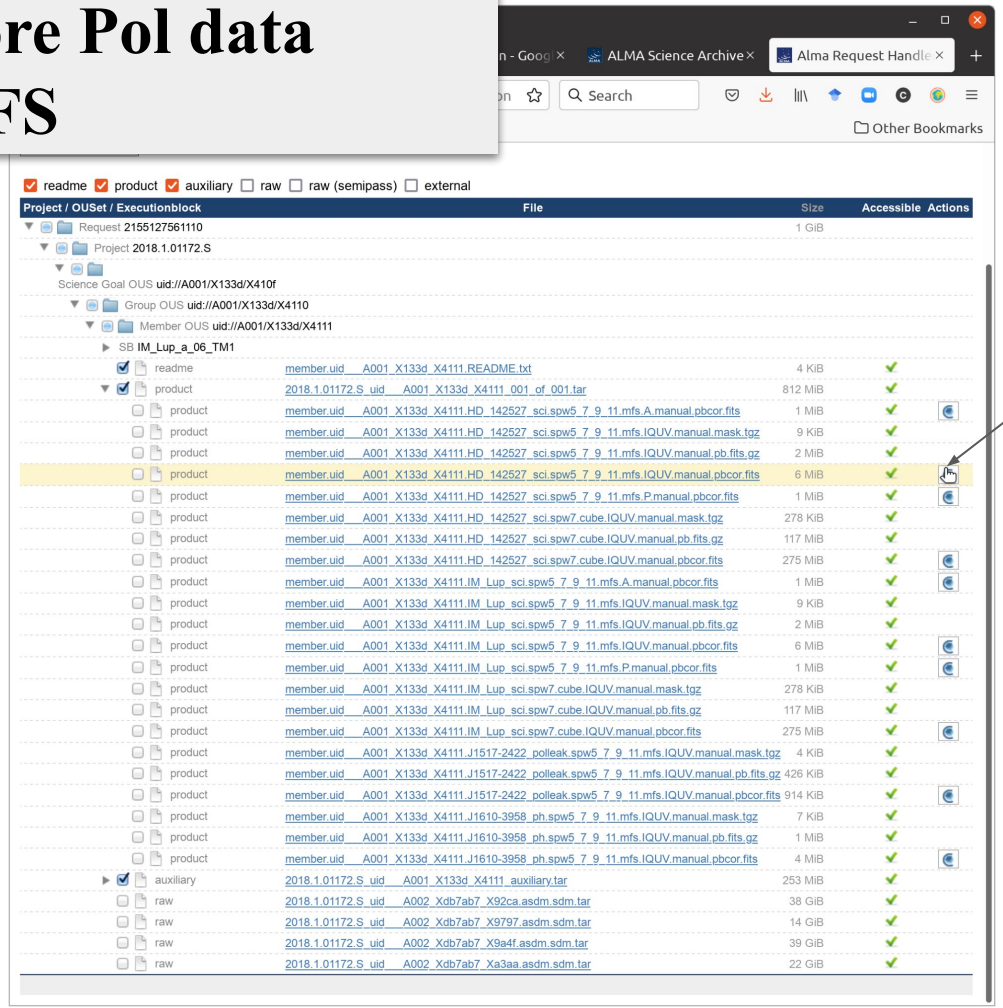
Click on Animator tab to get to Stokes comp. Besides def. Stokes I

Stokes V of pol calibrator



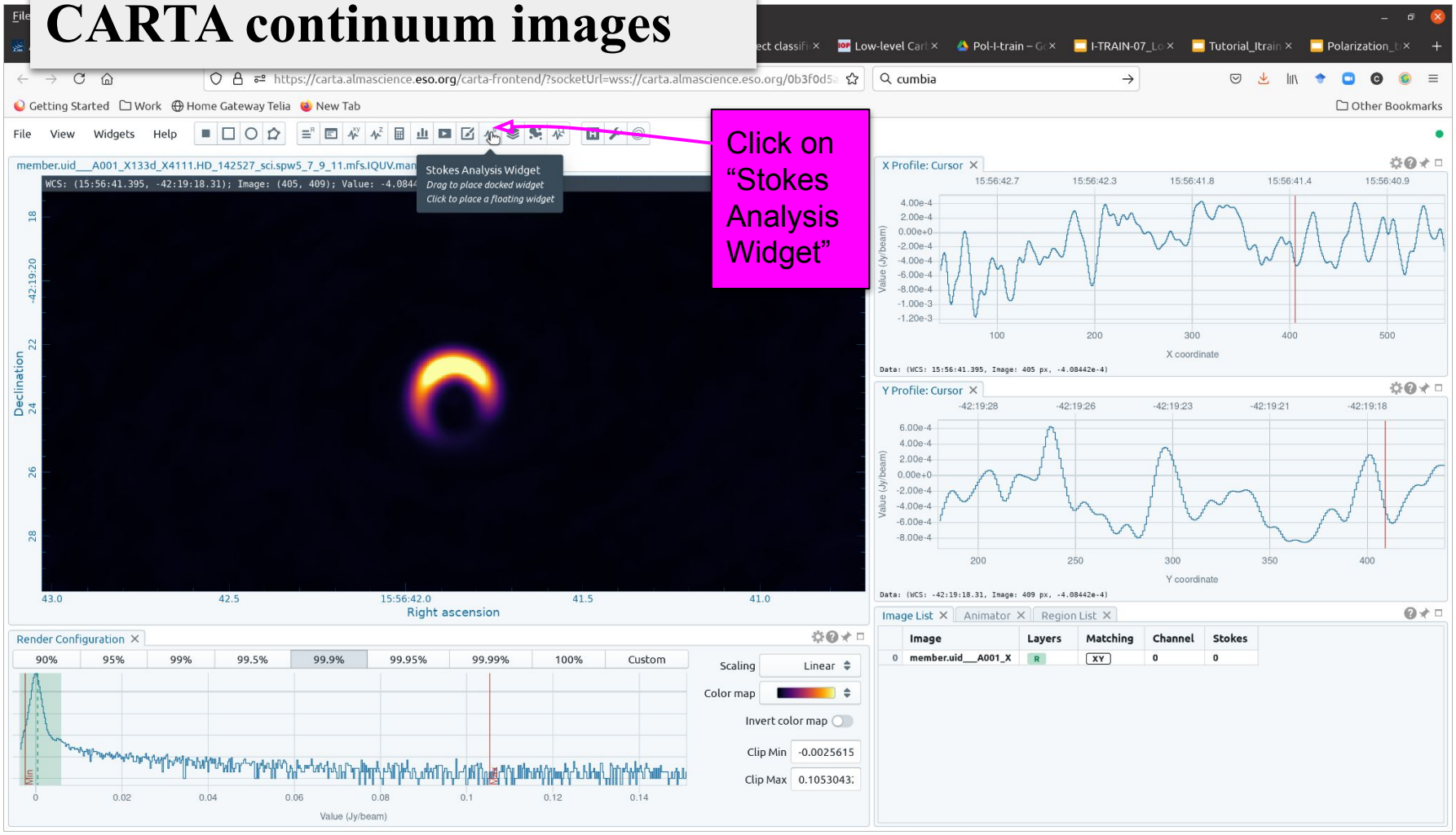
Slide Stokes comp. to #3 to get V
Mapping is (0,1,2,3)=>(I,Q,U,V)

Browsing more Pol data products: MFS

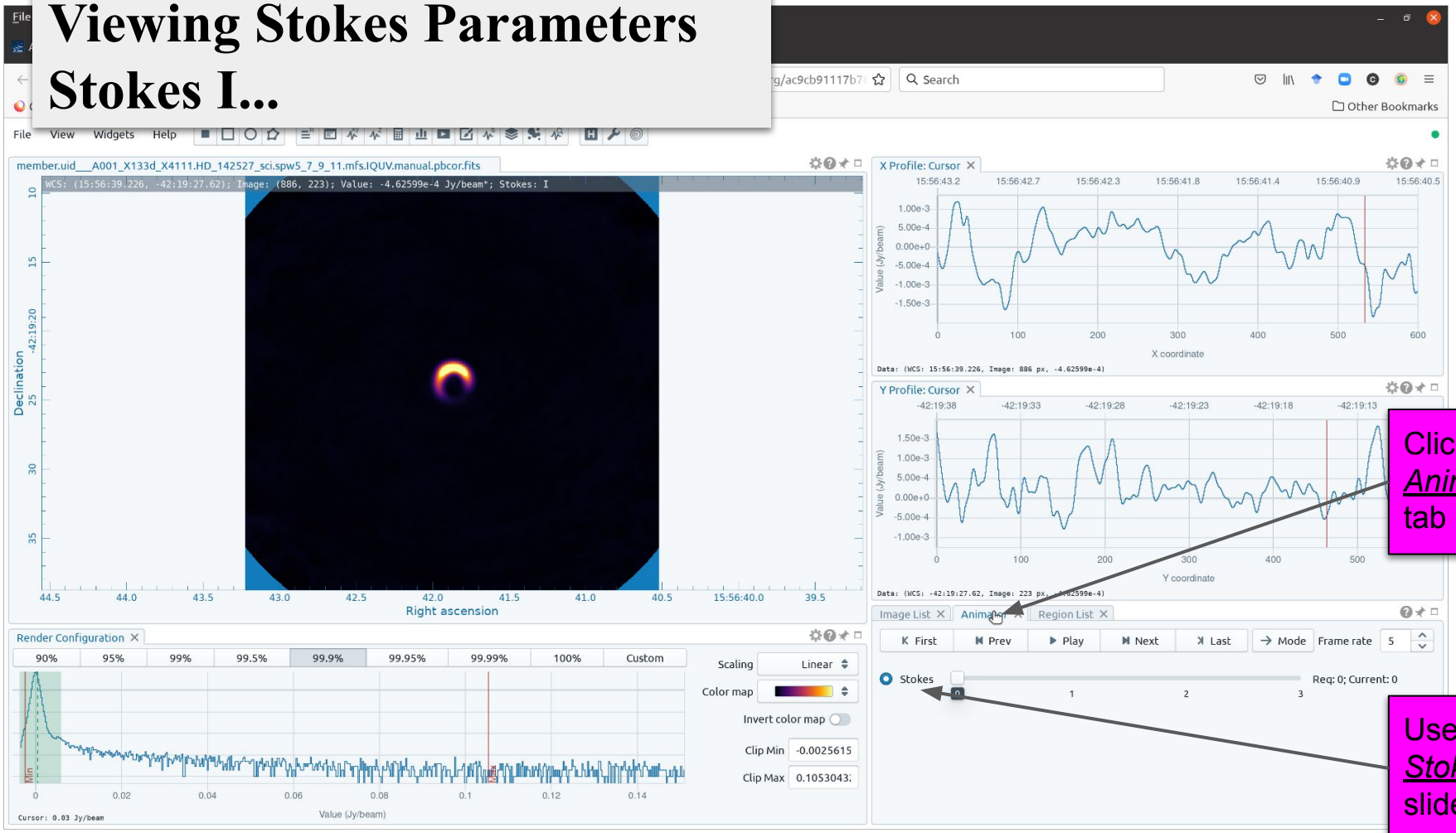


Click on CARTA button e.g. HD_142527 IQUV MFS

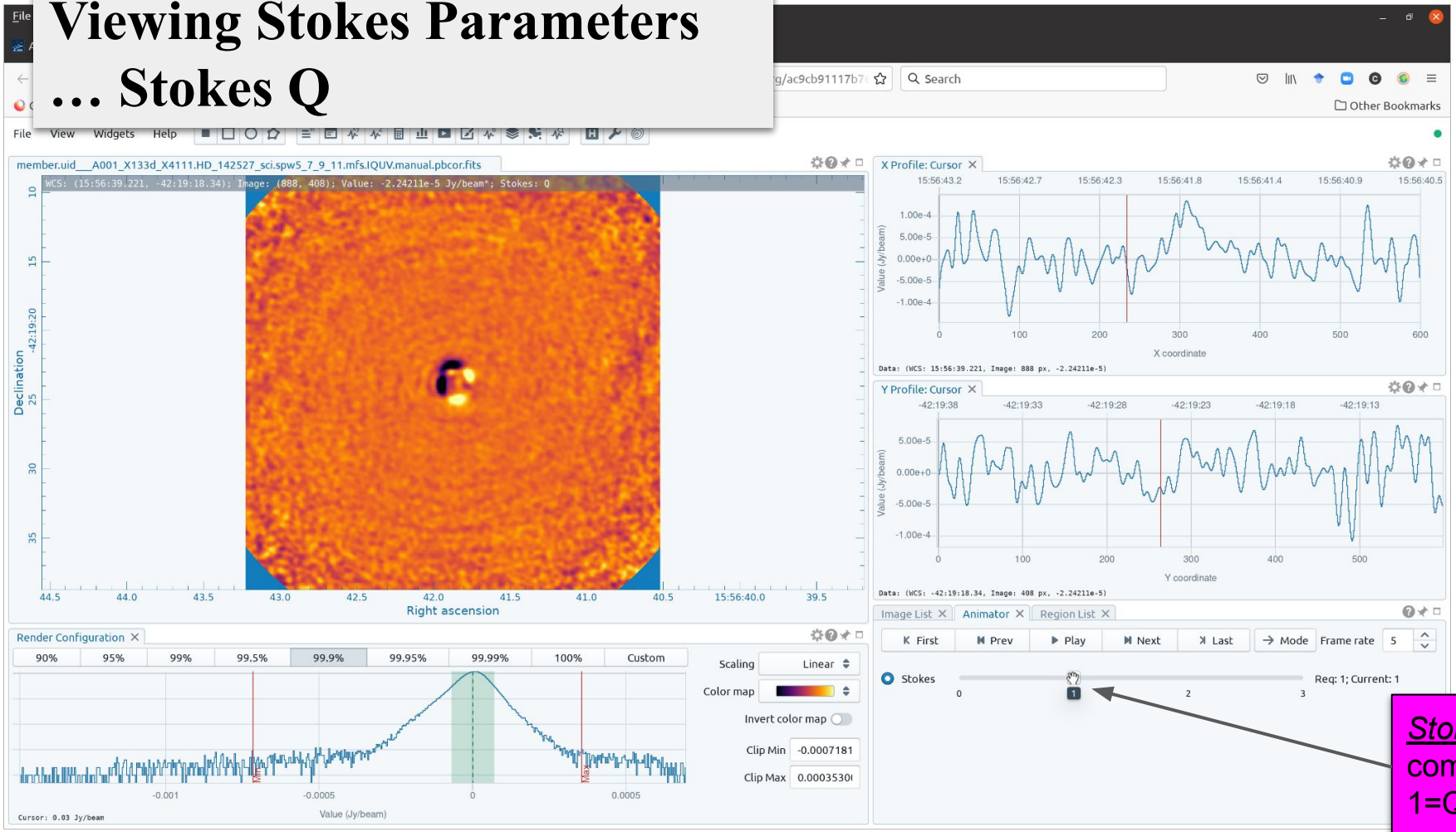
CARTA continuum images



Viewing Stokes Parameters
Stokes I...

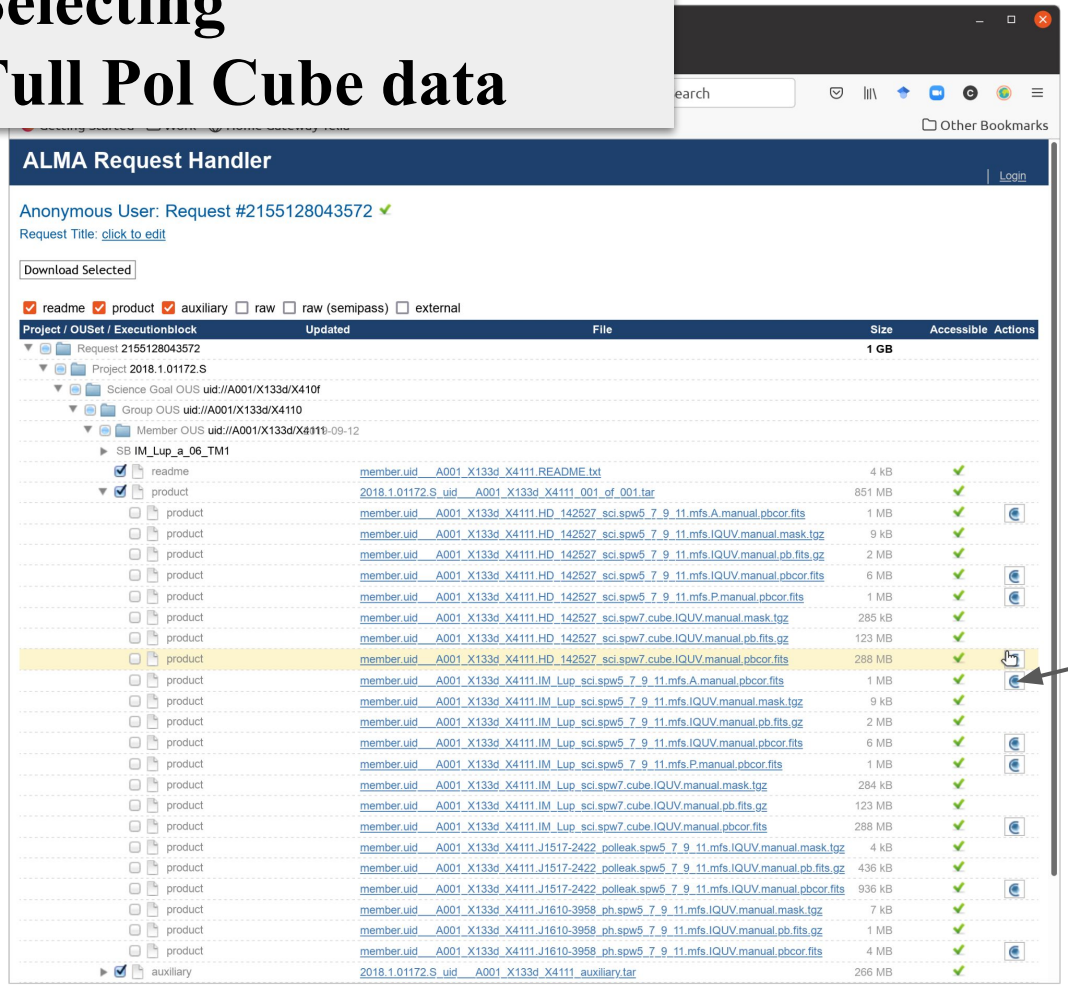


Viewing Stokes Parameters … Stokes Q



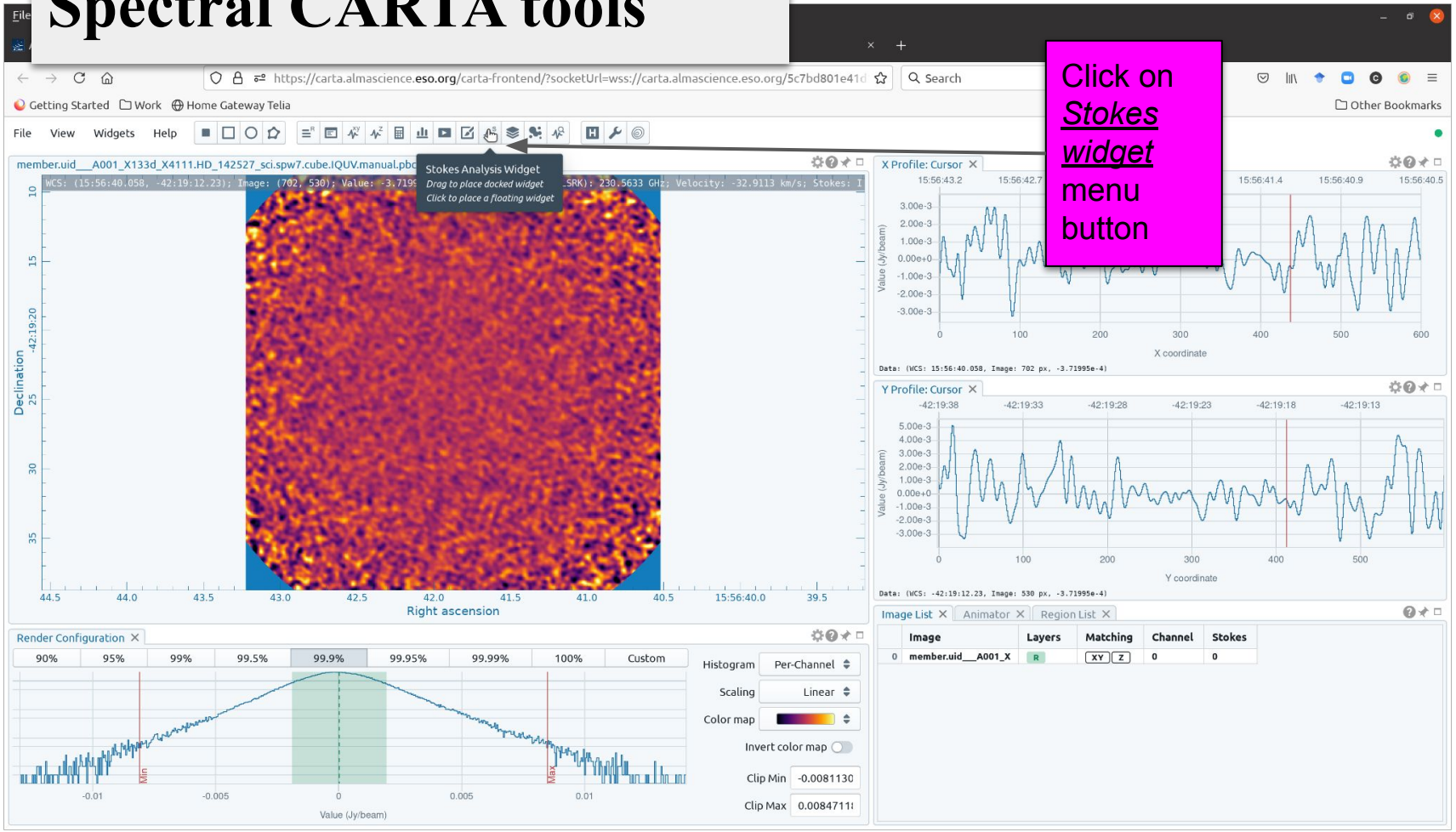
Stokes comp 1=Q

Selecting
Full Pol Cube data

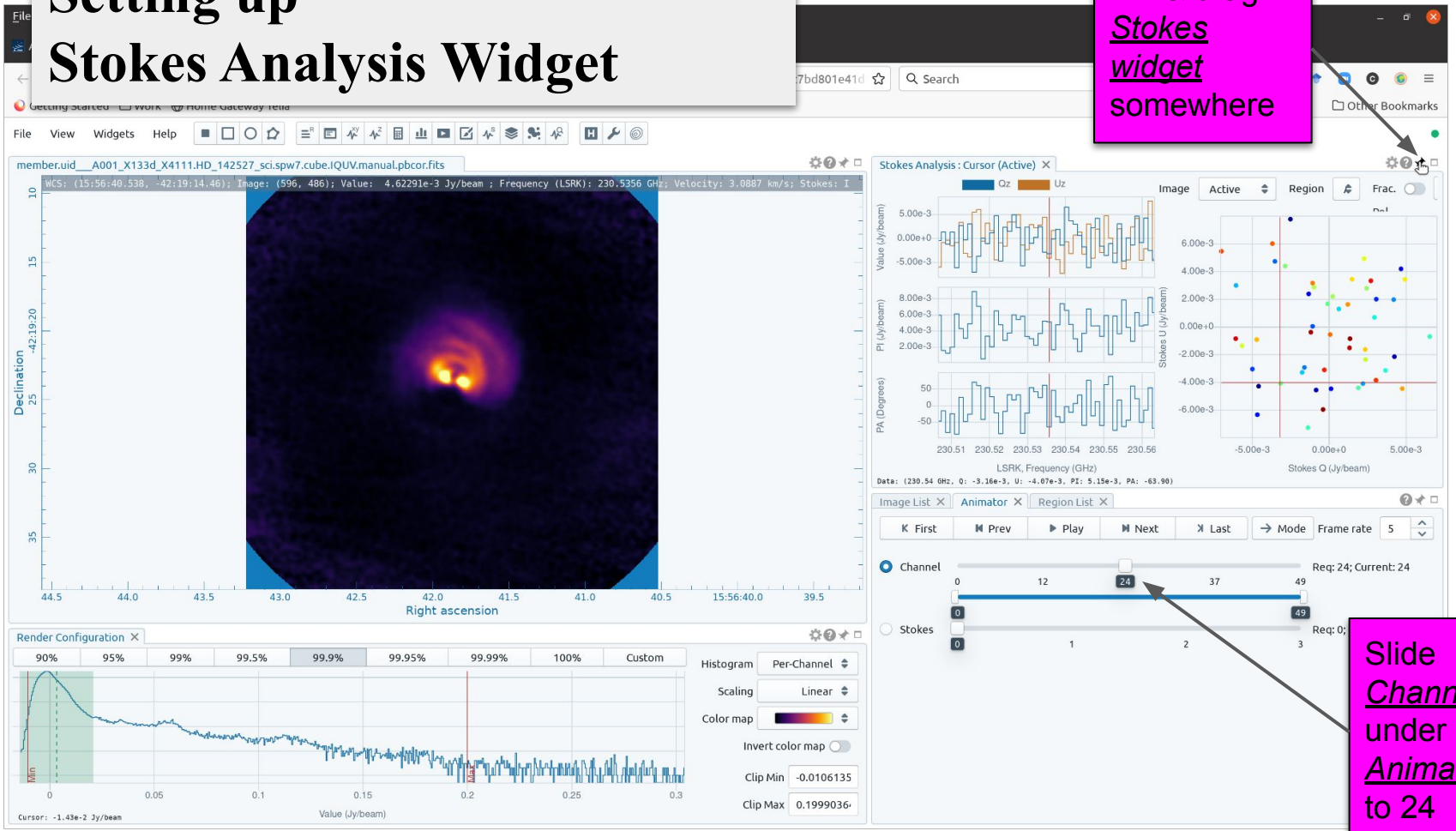


Click on *CARTA* button for .cube. FITS from data list

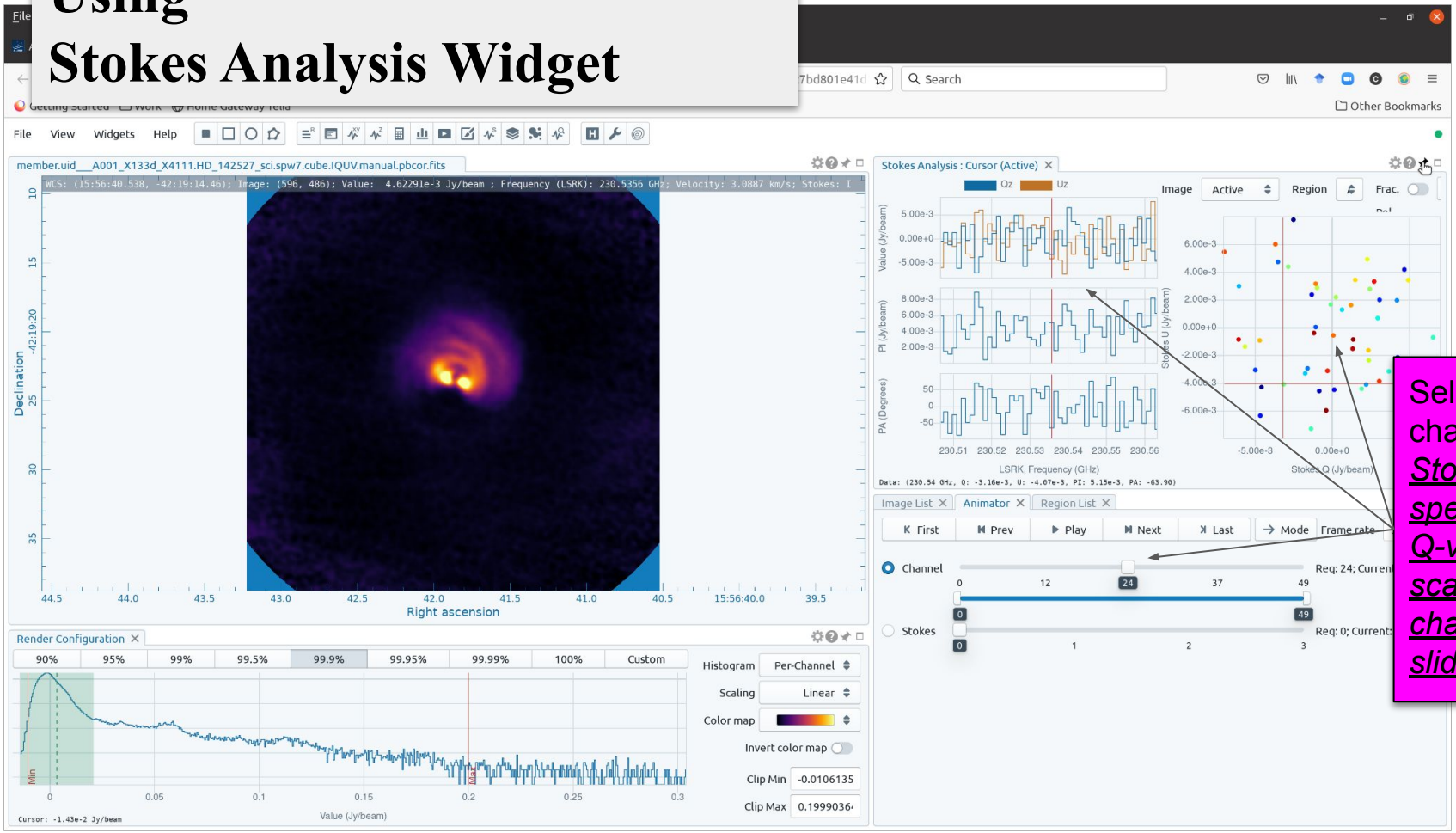
Spectral CARTA tools



Setting up
Stokes Analysis Widget

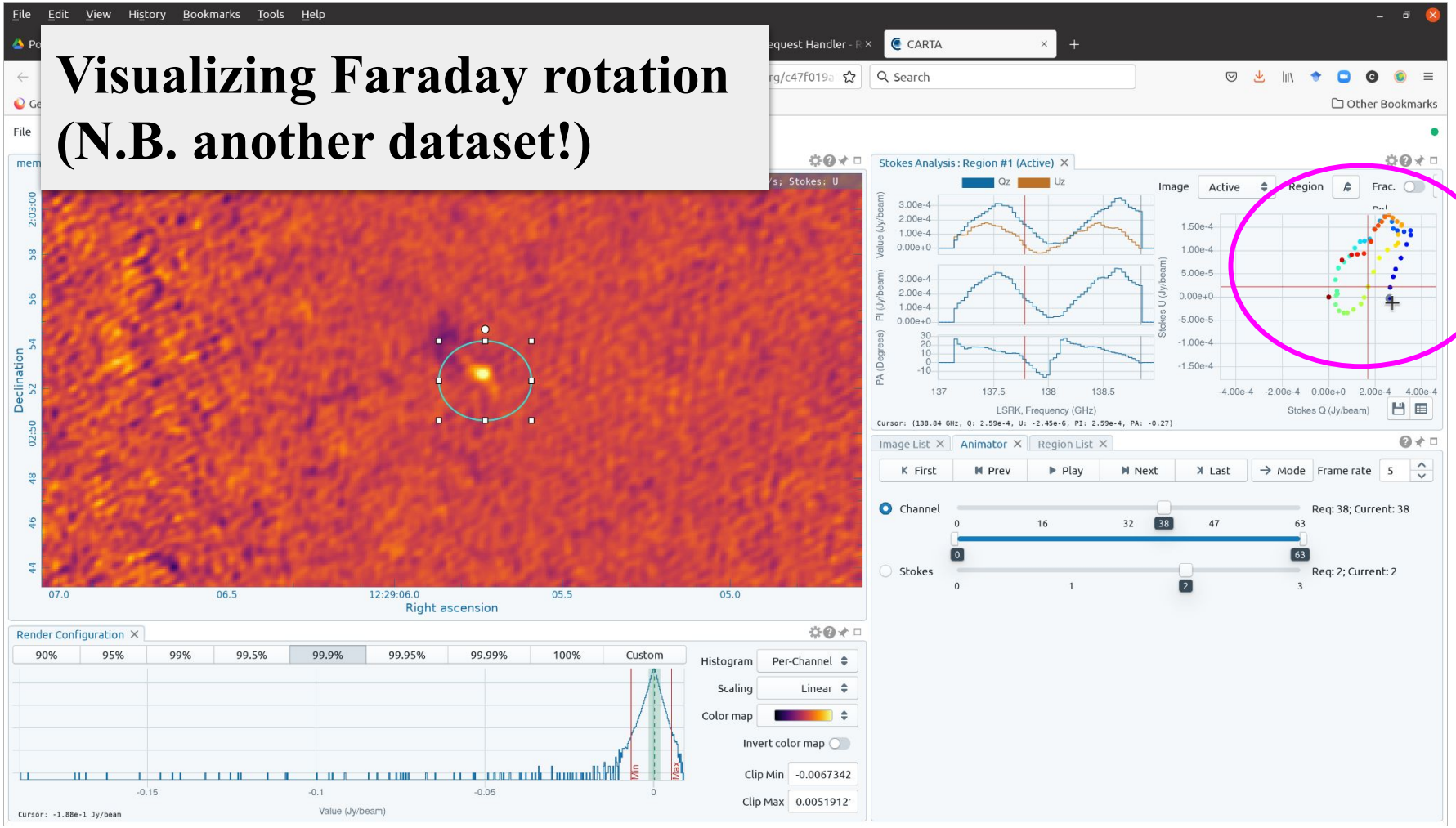


Using
Stokes Analysis Widget

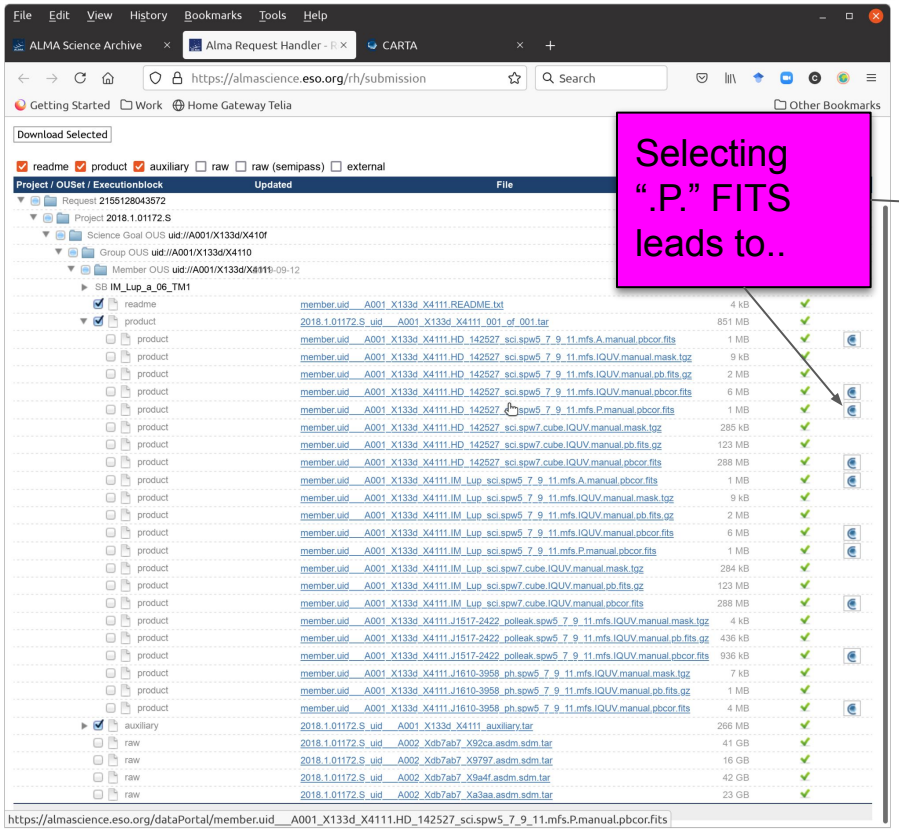


Select channel via *Stokes spectra* or *Q-vs-U scatterplot* or *channel slider*

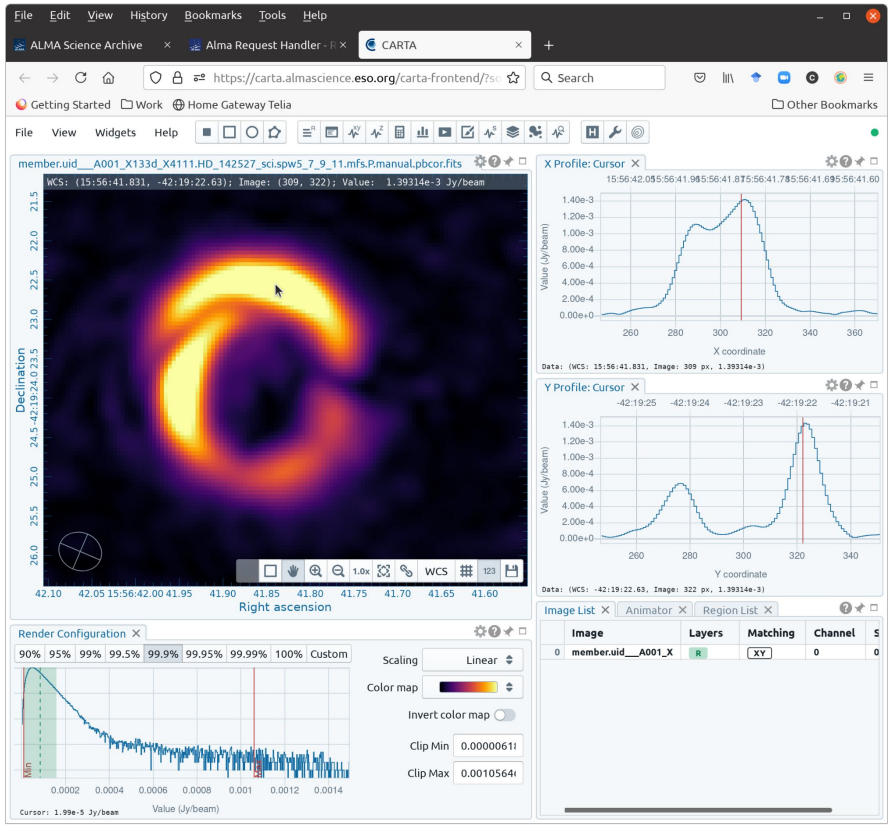
Visualizing Faraday rotation (N.B. another dataset!)



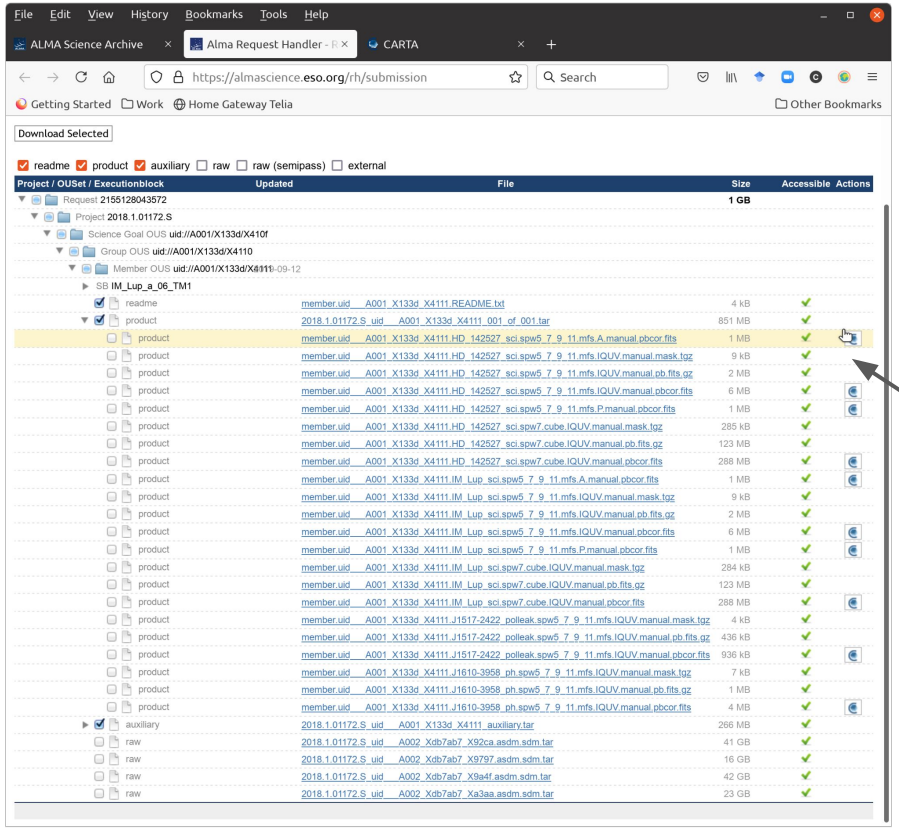
More pol products
.P. Lin Pol Flux



Selecting ".P." FITS leads to..

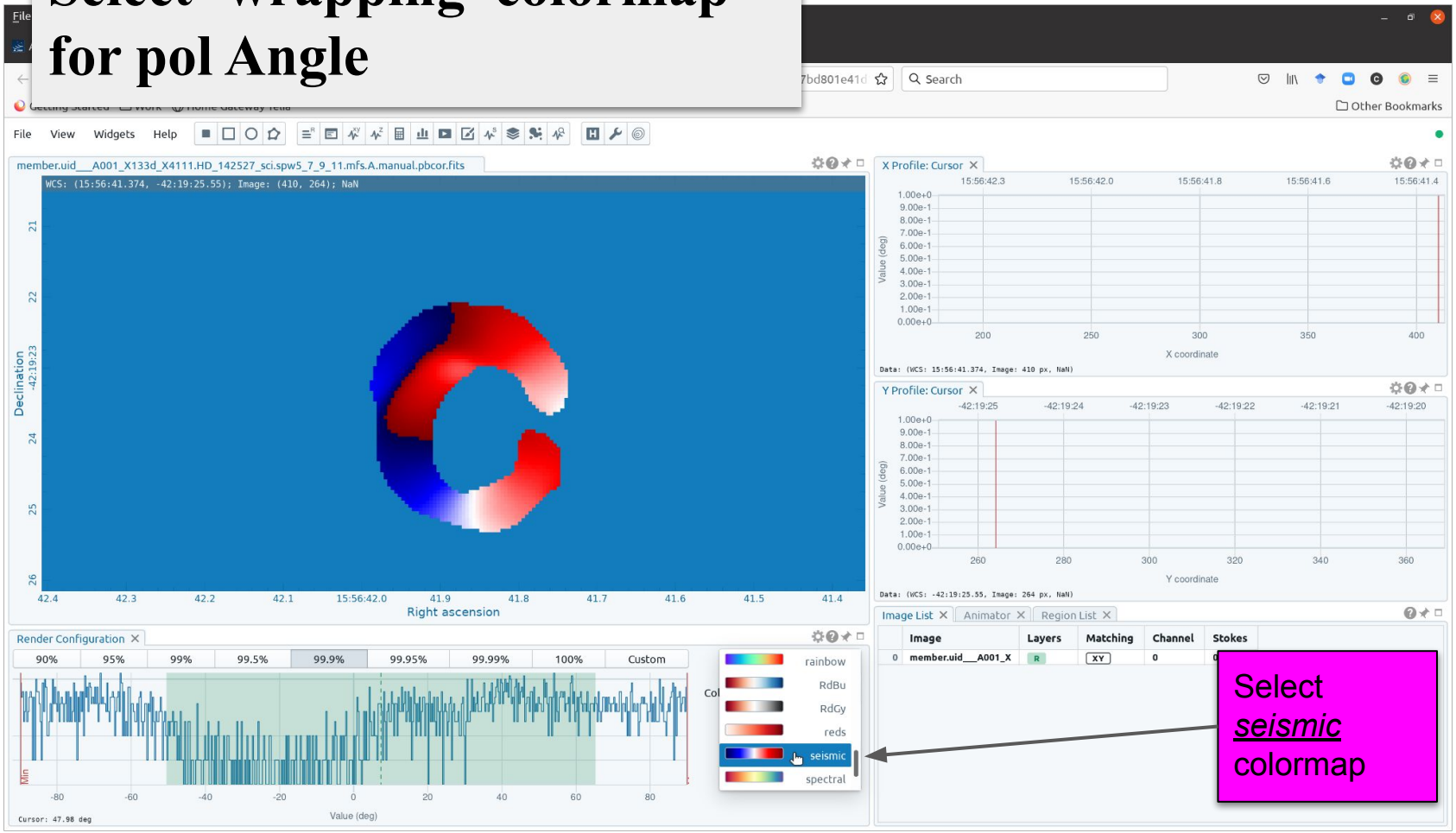


Even more Pol products:
.A. Electric Vector Position Angle



Select
".A." FITS for polarisation Angle aka
Electric Vector Position Angle or just PA

Select ‘wrapping’ colormap for pol Angle



Other sources

In this dataset besides science target HD_142527 there is also

- Sci target: IM_Lup
- Polleak: polarisation calibrator

You may wish to explore these yourselves...

Conclusion

- Full Pol ALMA archive is ...
  - easy to use
  - 100s of public datasets already now (2021)
  - Half of it is unpublished
  - Easy to start up CARTA
- CARTA is ...
  - Stable
  - Quick to use
  - Polarisation aware

So go online and start exploring ALMA Polarisation data!

Thanks