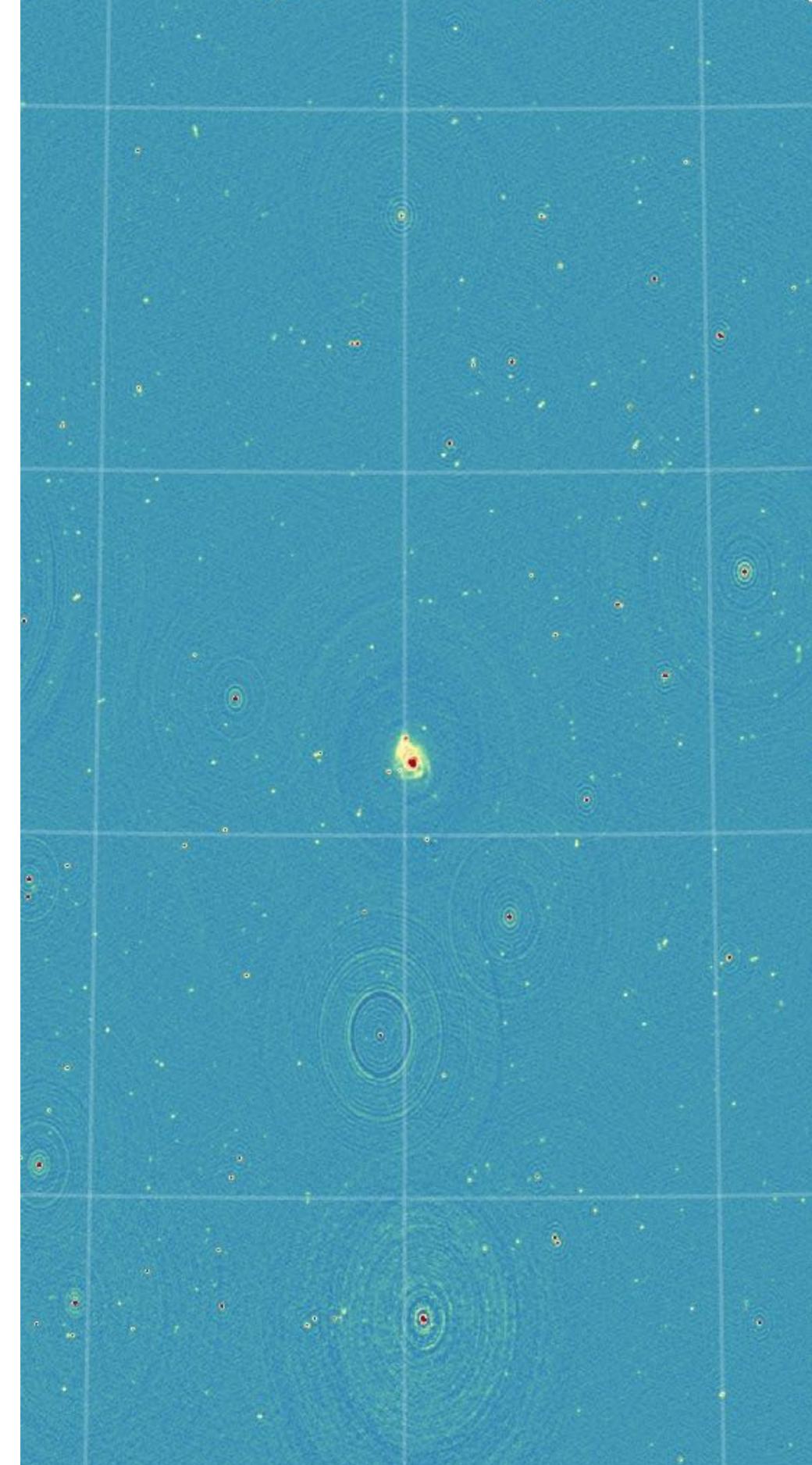

Apertif Data QA

Betsey Adams

Apertif imaging commissioning lead

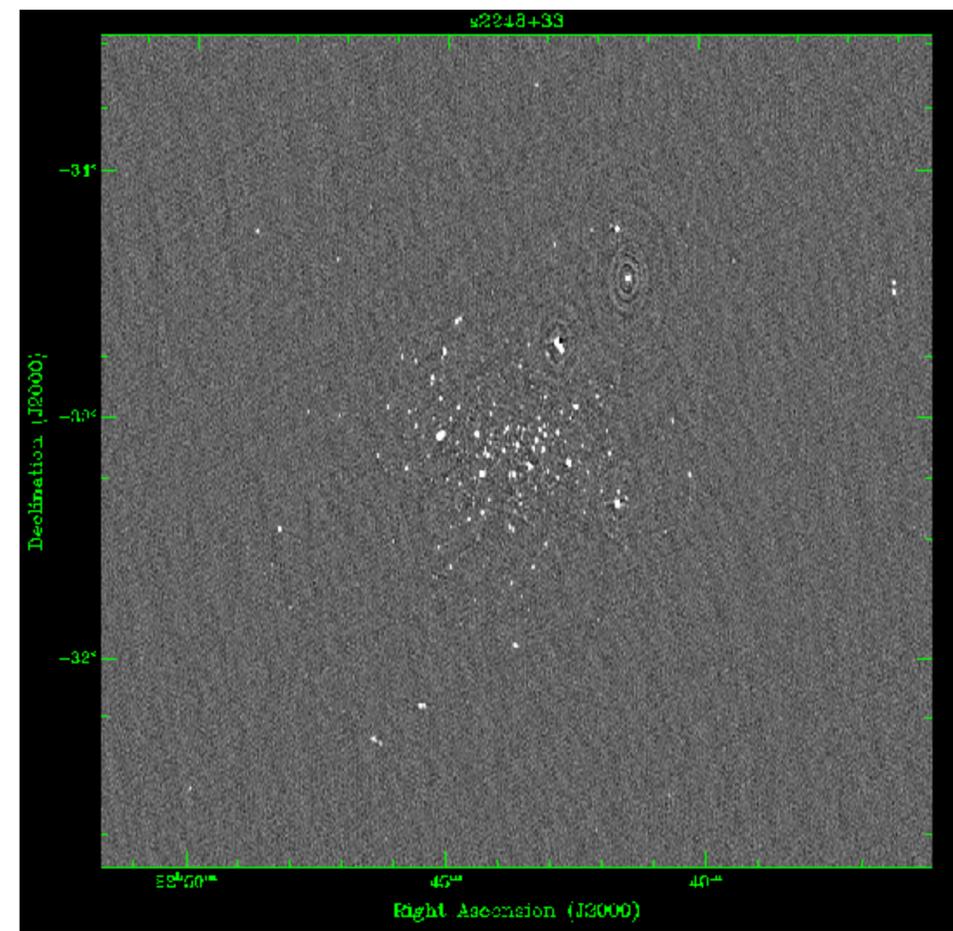
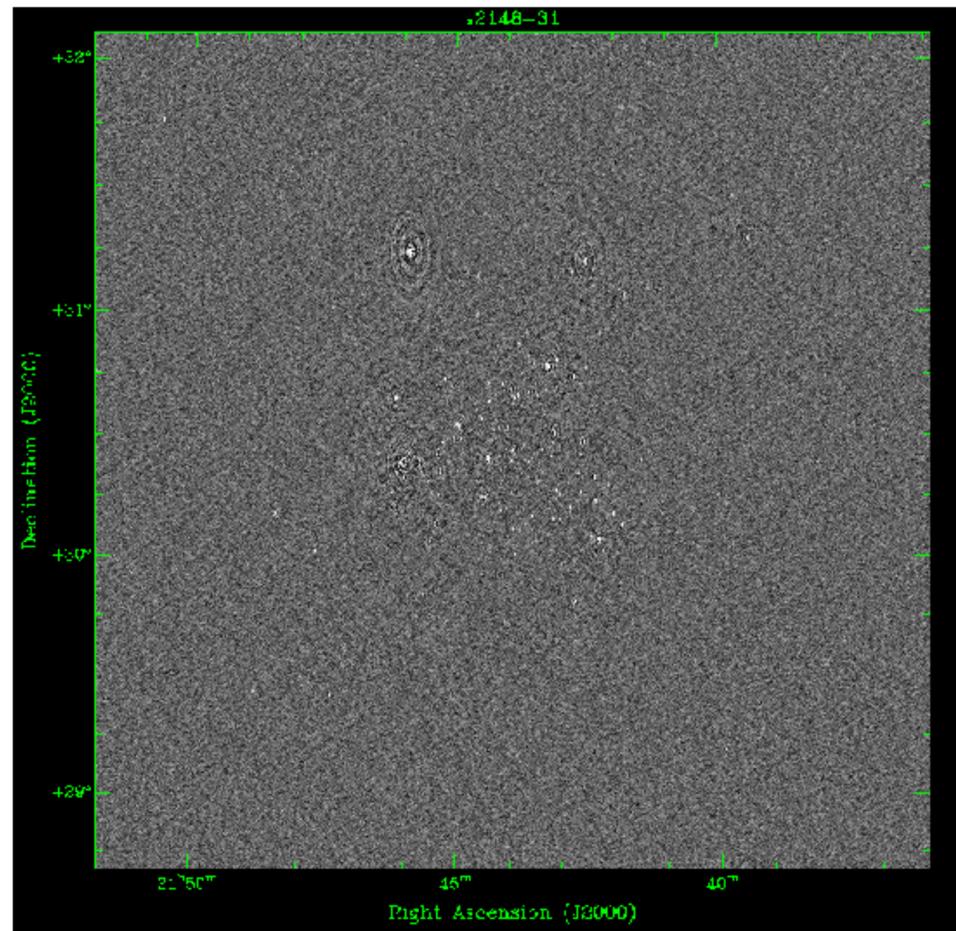
Head of Apertif Science Operations

7 May 2019



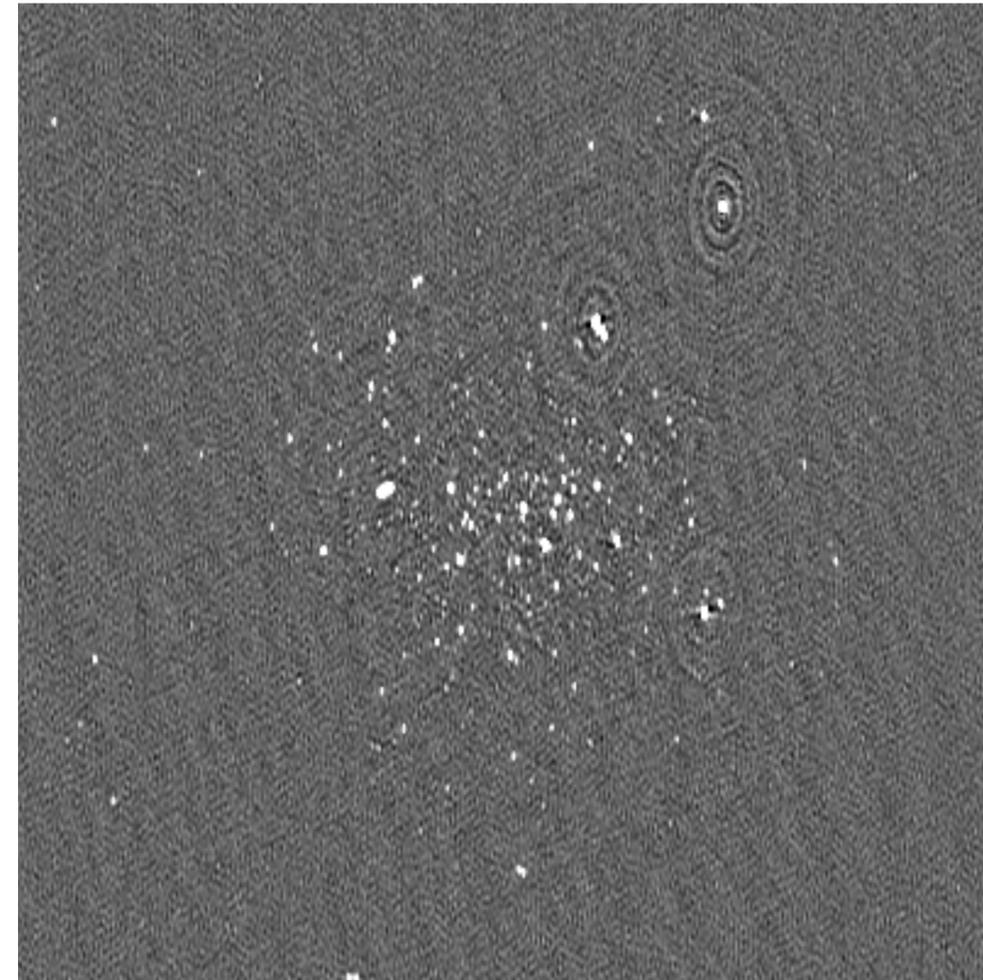
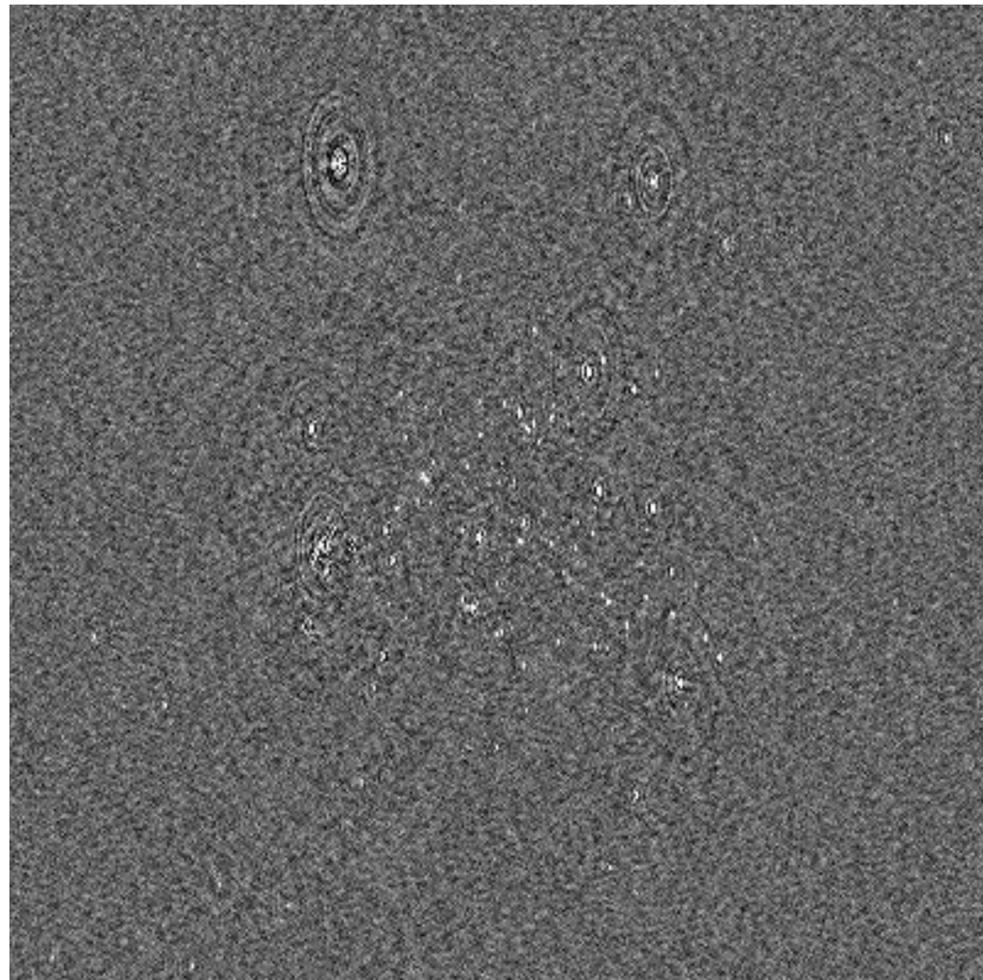
Apertif Science Verification Campaign

- Four week period to demonstrate science capabilities
- Significant development of QA tools in preparation for this period



Apertif Science Verification Campaign

- Four week period to demonstrate science capabilities
- Significant development of QA tools in preparation for this period



Apertif Data QA

- Four week period to demonstrate science capabilities
- Significant development of QA tools in preparation for this period



APERTIF Quality Assessment Overview

List of Observations

Note: This website will allow you to go through the different quality assessment products in addition to the apercal logfile from each node. It will not give you access to fits images and the source catalogue

190419137

[preflag](#)

[crosscal](#)

[selfcal](#)

[continuum](#)

[line](#)

[mosaic](#)

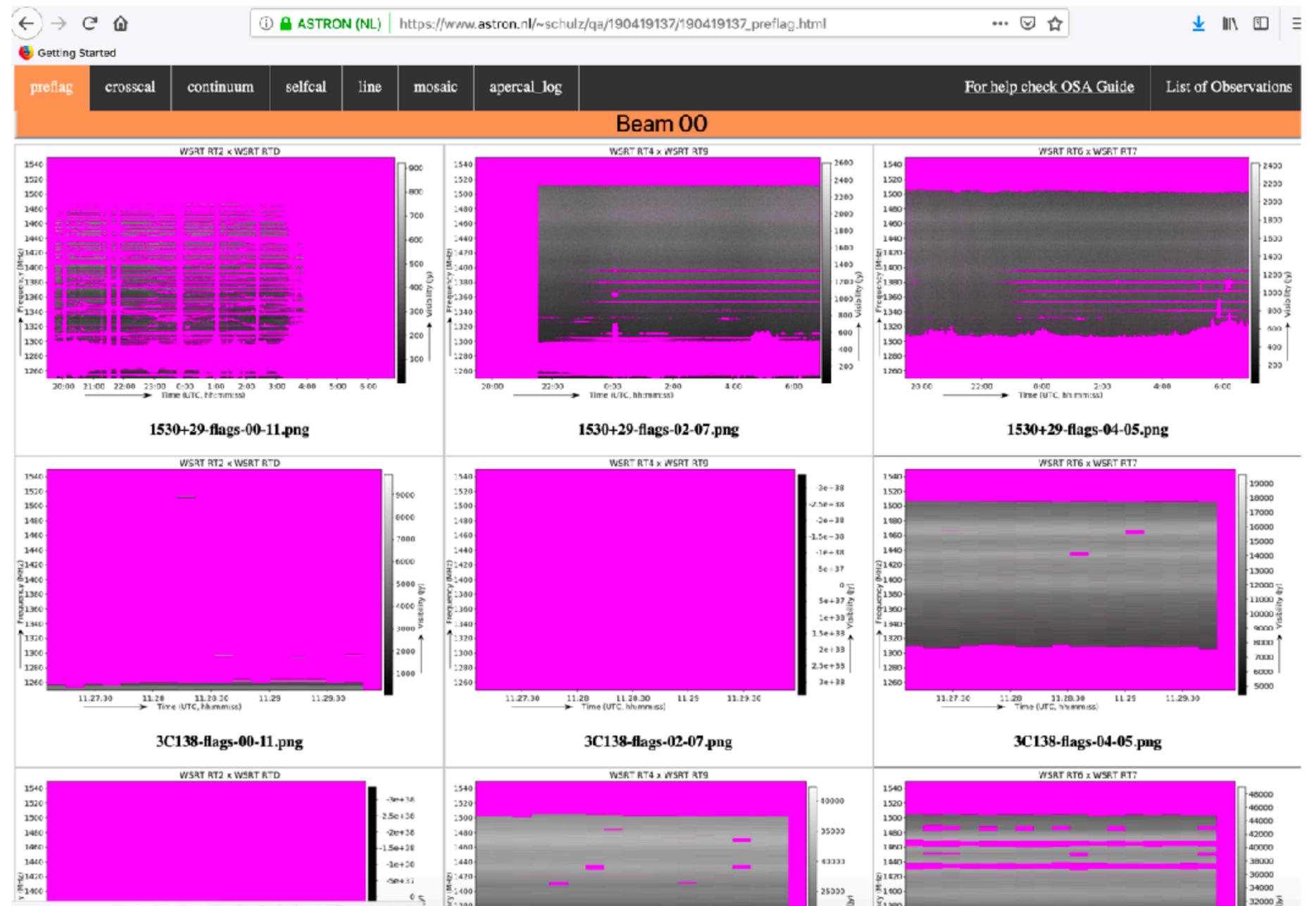
[apercal.log](#)

HTML report by Robert Schulz



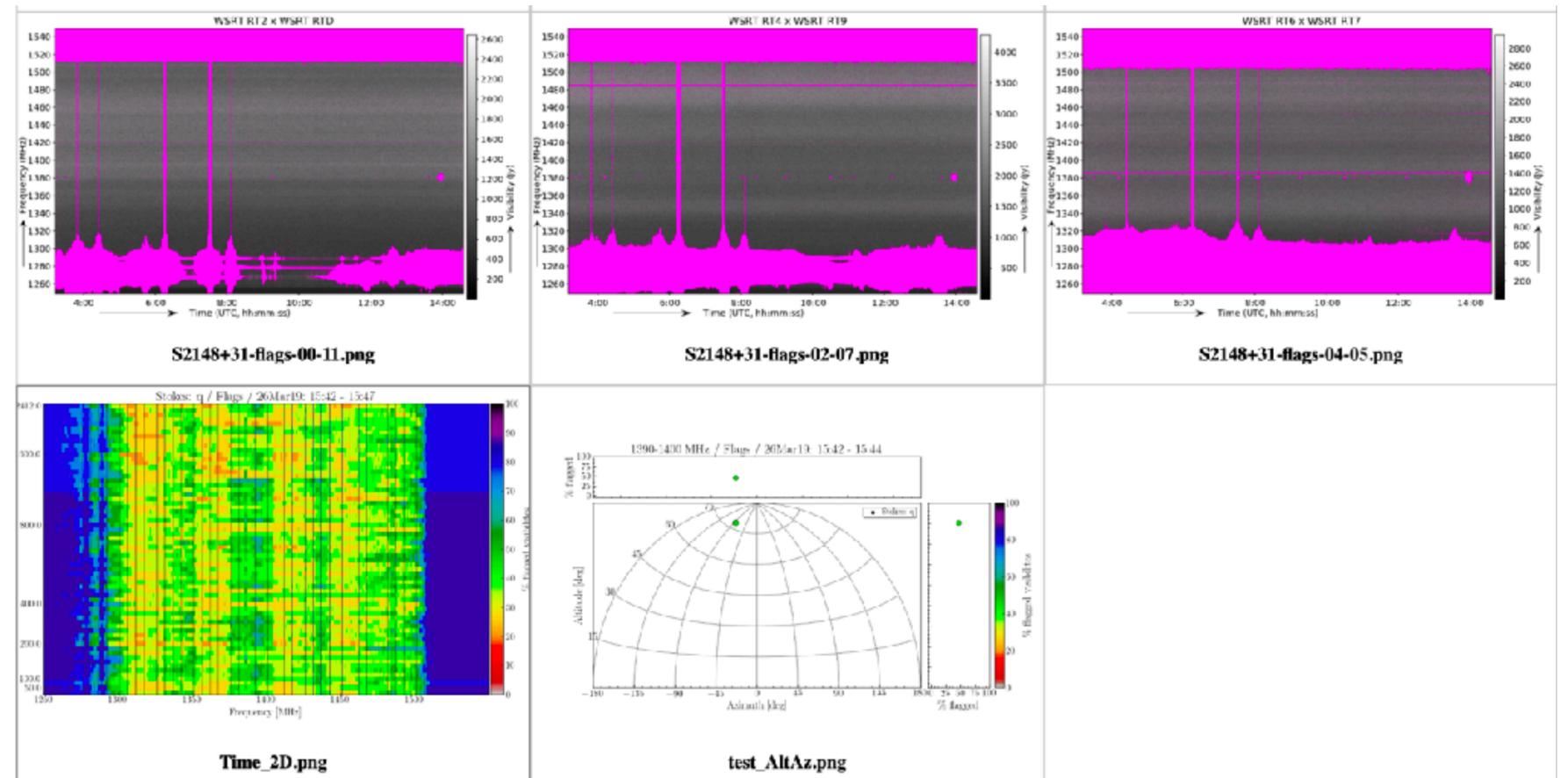
Flagging QA

- Visualize AOFlagger output
- RFInder tool after pipeline run (<https://github.com/Fil8/RFInder>)



Flagging QA

- Visualize AOFlagger output
- RFInder tool after pipeline run (<https://github.com/Fil8/RFInder>)
- Provides a look at flagging that happens in cross-calibration step



Cross-calibration QA

- Visualize cross-calibration solutions
- Need to create interaction with pipeline

190419137 crosscal

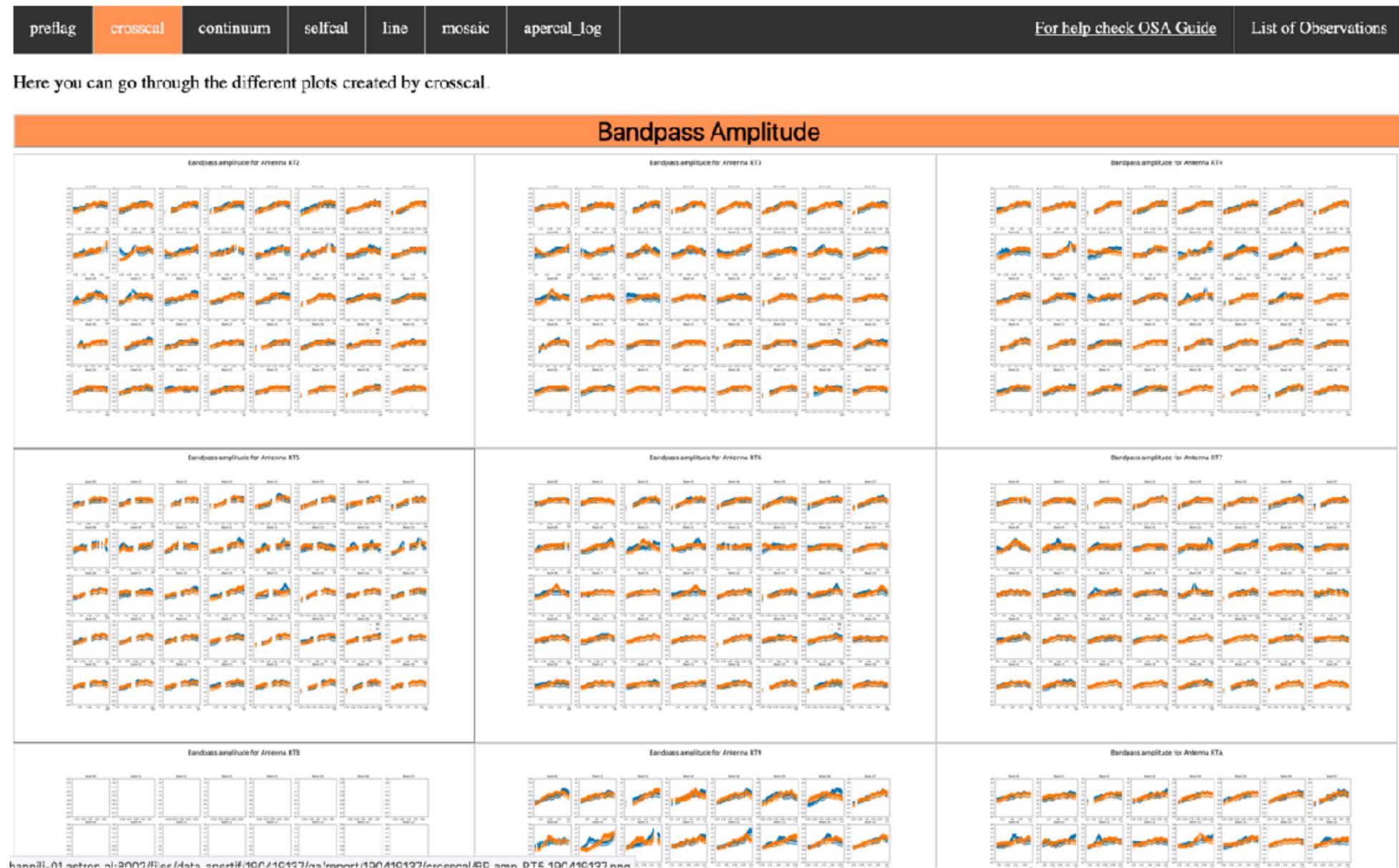
preflag	crosscal	continuum	selfcal	line	mosaic	apercal_log	For help check OSA Guide	List of Observations
---------	-----------------	-----------	---------	------	--------	-------------	--	--------------------------------------

Here you can go through the different plots created by crosscal.

Bandpass Amplitude
Bandpass Phase
Gain factors Amplitude
Gain factors Phase
Global Delay
Leakage Amplitude
Leakage Phase
Cross Hand Delay
Polarization Angle Amplitude
Polarization Angle Phase
Raw visibility Amplitude
Raw Visibility Phase
Model Amplitude
Model Phase
Corrected Amplitude
Corrected Phase

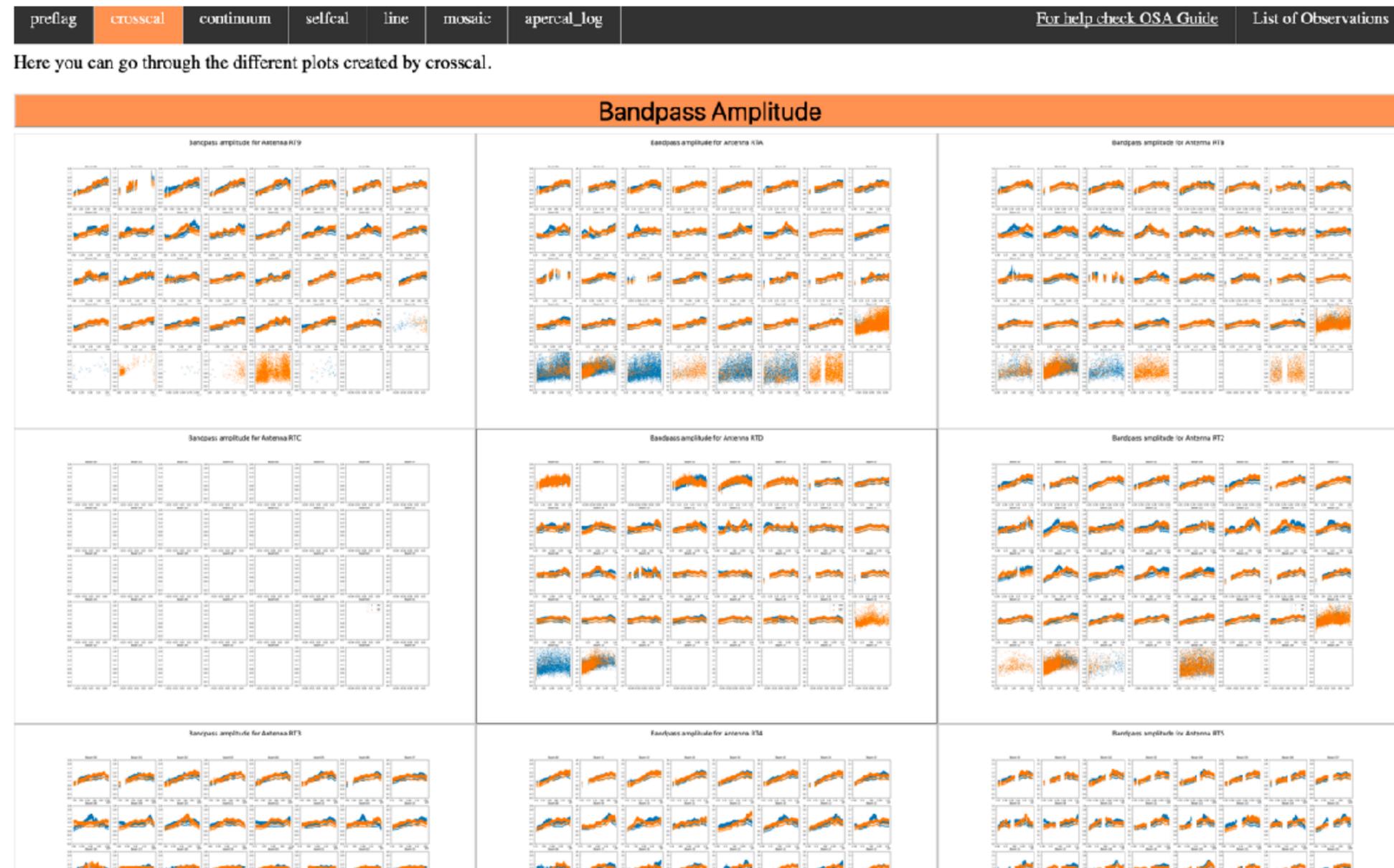
Cross-calibration QA

- Visualize cross-calibration solutions
- Need to create interaction with pipeline



Cross-calibration QA

- Visualize cross-calibration solutions
- Need to create interaction with pipeline
- Identify failed calibration solutions and flag/rerun as appropriate



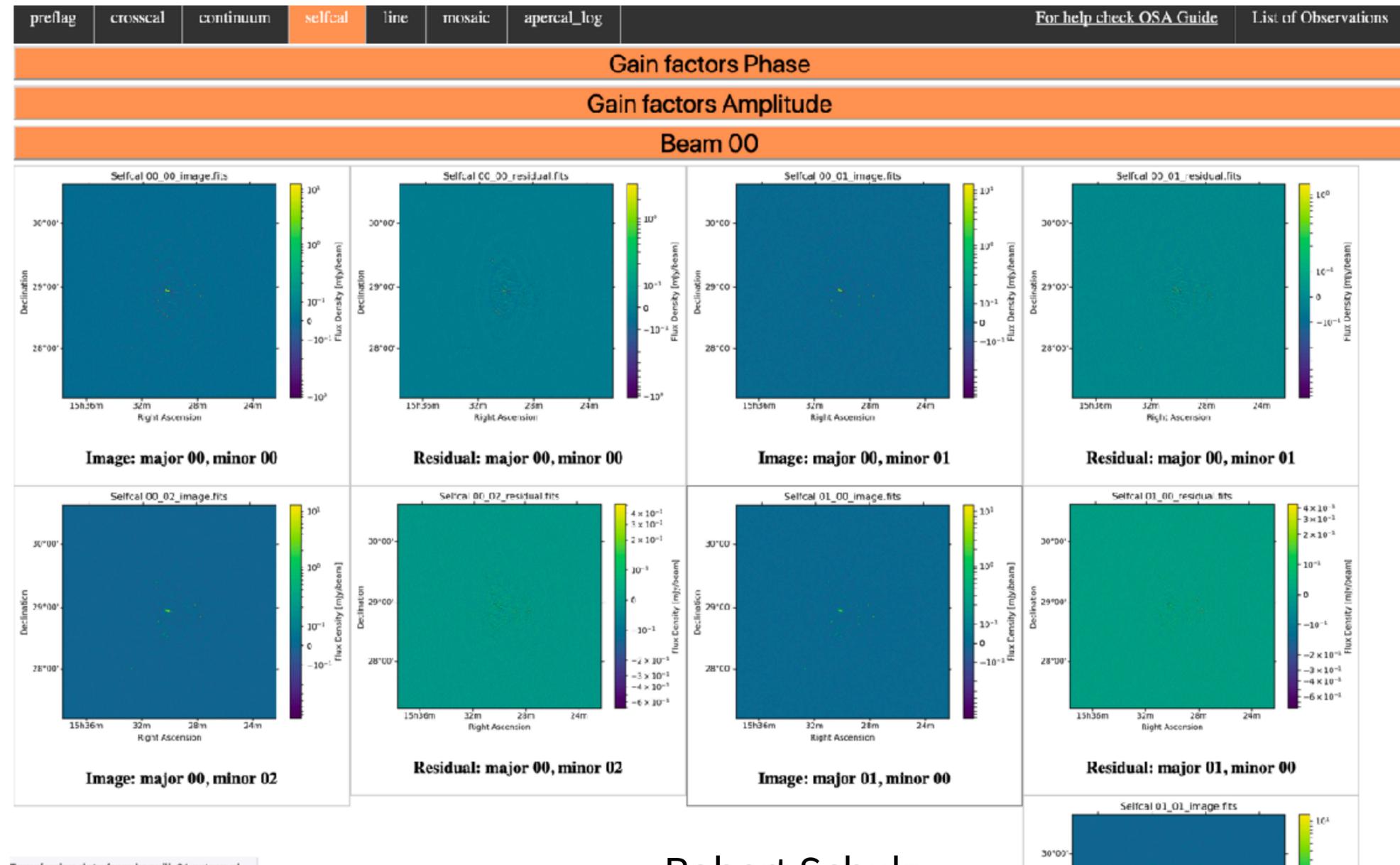
Cross-calibration QA

- Visualize cross-calibration solutions
- Need to create interaction with pipeline



Self-calibration QA

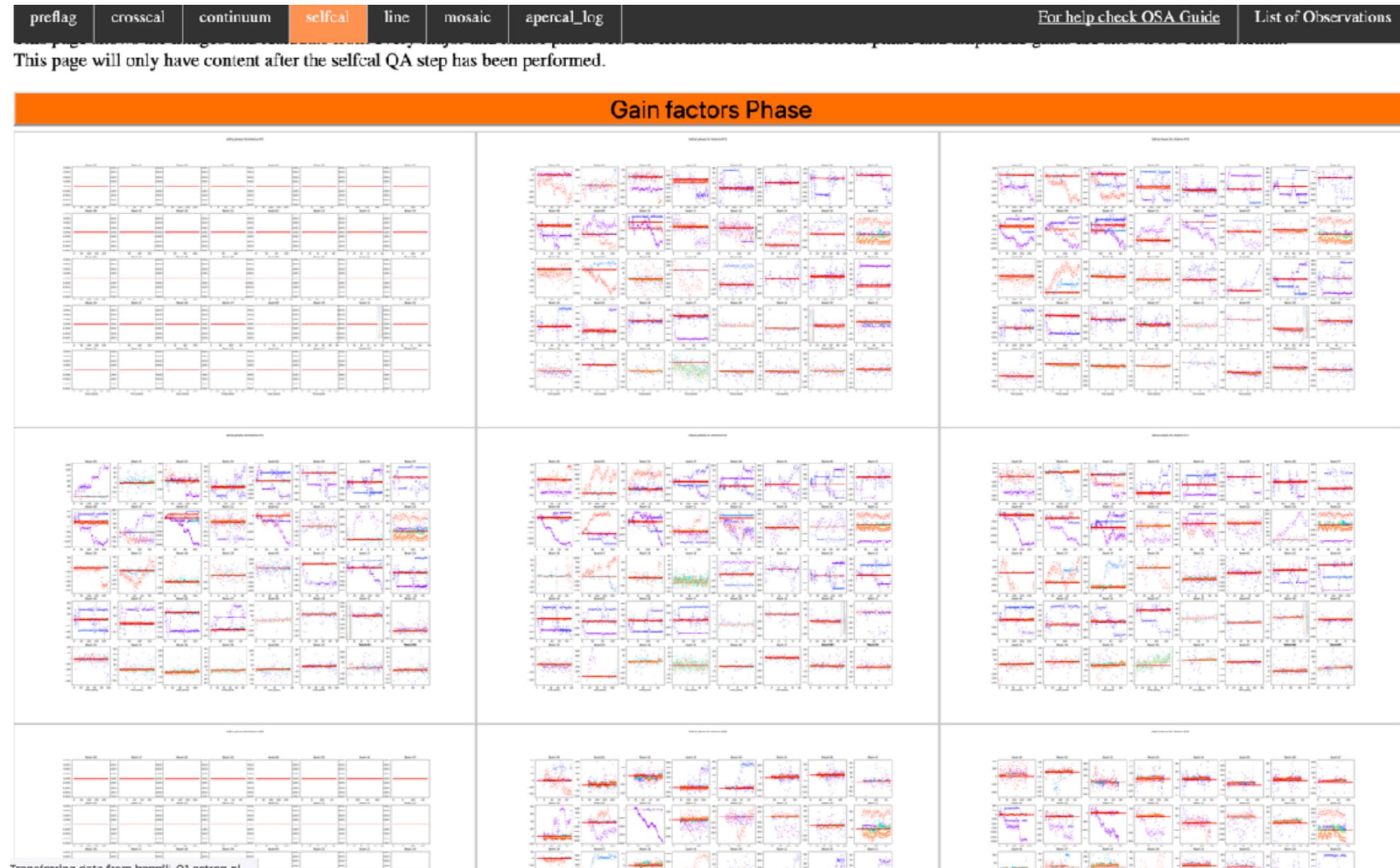
- Check selfcal images
- Visualize self-calibration solutions
- Need to create interaction with pipeline



Robert Schulz

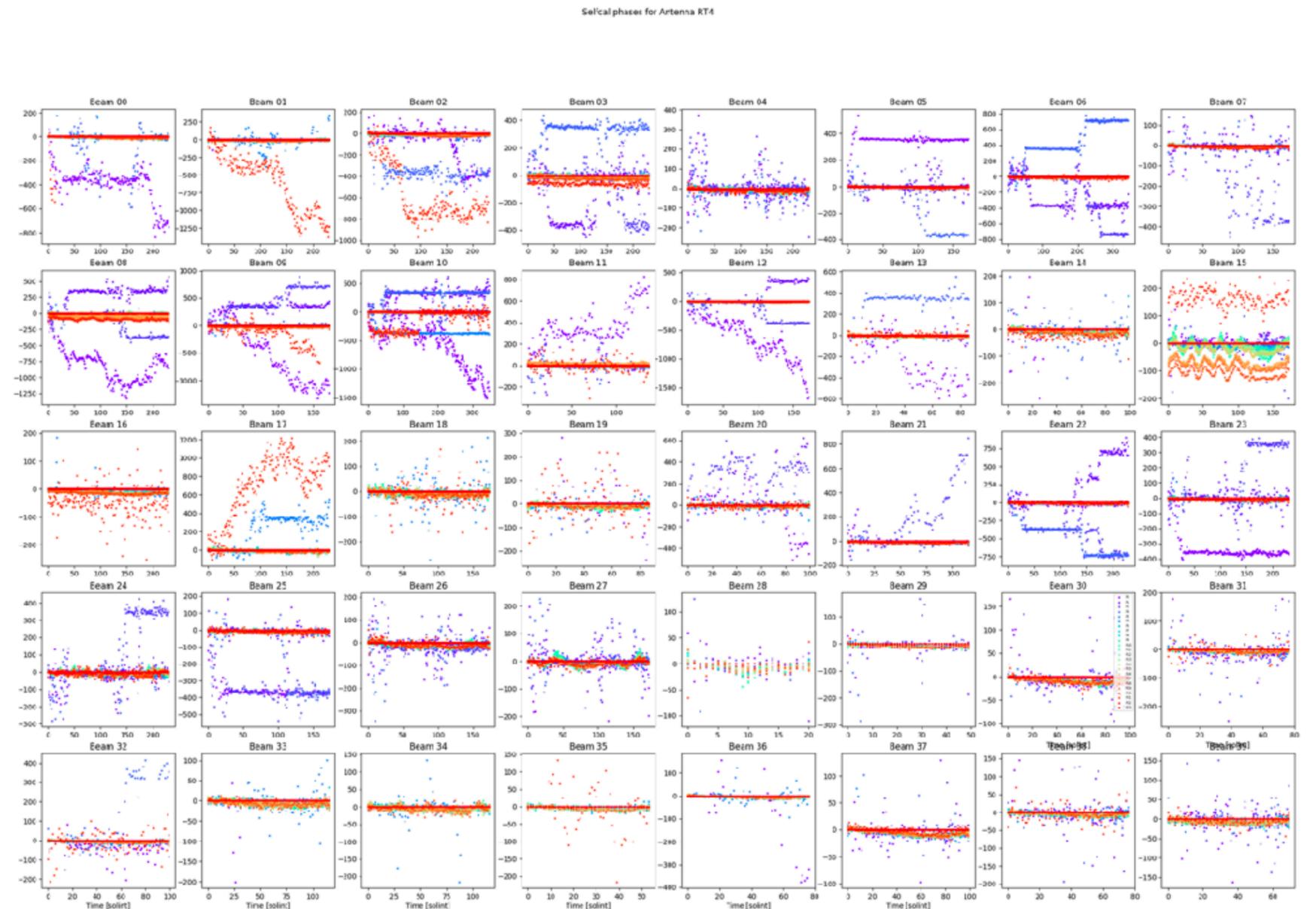
Self-calibration QA

- Check selfcal images
- Visualize self-calibration solutions
- Need to create interaction with pipeline



Self-calibration QA

- Check selfcal images
- Visualize self-calibration solutions
- Need to create interaction with pipeline
 - Identify bad frequency bins



Continuum images QA

190419137 continuum

preflag	crosscal	continuum	selfcal	line	mosaic	apercal_log	For help check OSA Guide	List of Observations
---------	----------	-----------	---------	------	--------	-------------	--	--------------------------------------

Here you can inspect for each beam the continuum image, PyBDSF diagnostic plots and the validation tool. The PyBDSF catalog is not accessible from this page, but can be found in the QA directory as a csv table. Of course, all of this only exists for beams with a continuum image created by the pipeline. This page will only have content after the continuum QA step has been performed.

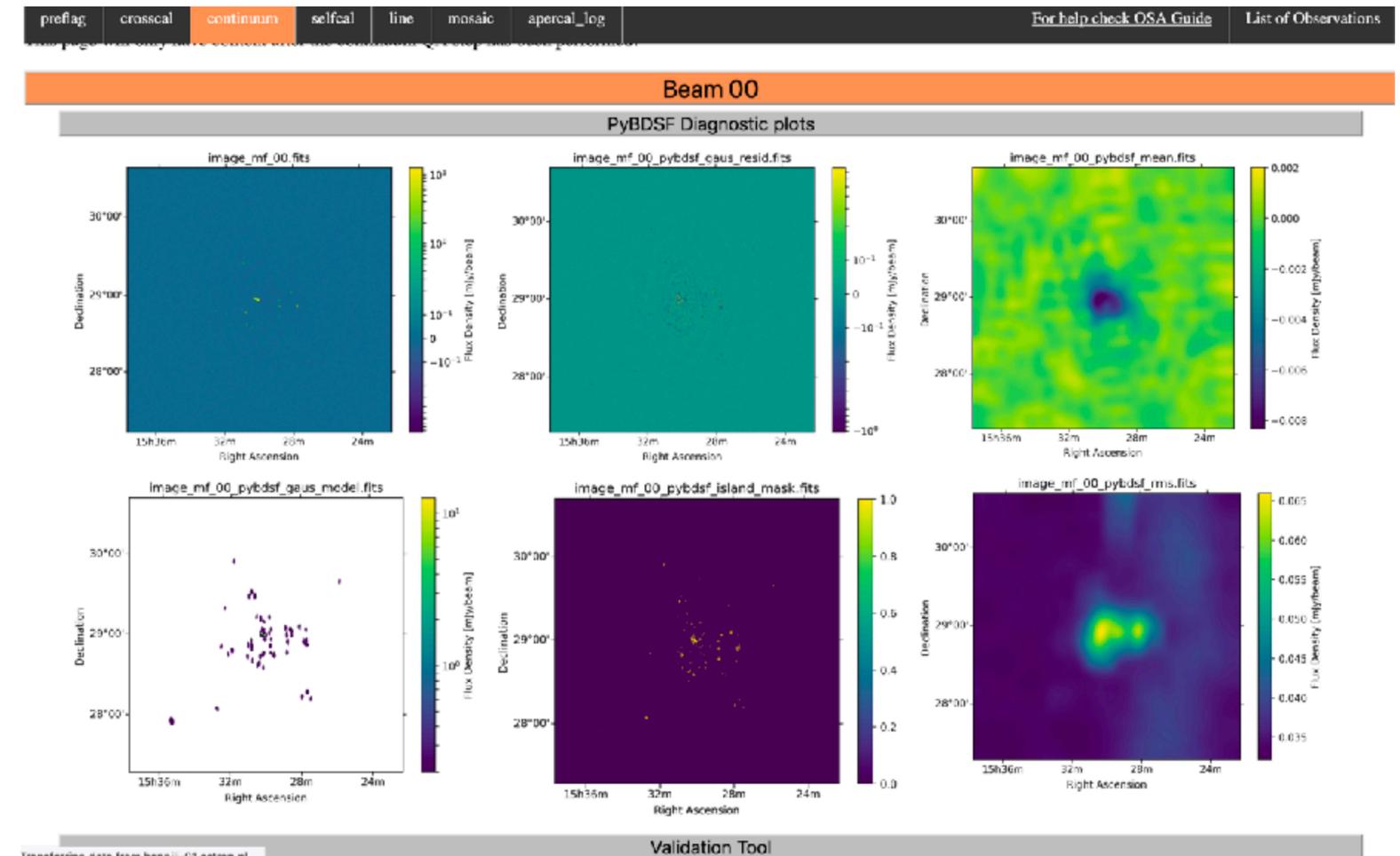
Beam 00
Beam 01
Beam 02
Beam 03
Beam 04
Beam 05
Beam 06
Beam 07
Beam 08
Beam 09
Beam 10
Beam 11
Beam 12
Beam 13
Beam 14
Beam 15

- Check images
- Continuum validation tool from Jordan Collier, adapted
- Need to automate reporting of statistics

Robert Schulz

Continuum images QA

- Check images
- Continuum validation tool from Jordan Collier, adapted
- Need to automate reporting of statistics



Robert Schulz

Continuum images QA

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- Continuum validation tool from Jordan Collier, adapted
- Need to automate reporting of statistics

preflag crosscal continuum selfcal line mosaic apercal_log [For help check OSA Guide](#) [List of Observations](#)

15h38m 32m 28m 24m 0.0 Right Ascension Right Ascension

Validation Tool

APERTIF Continuum Data Validation Report

Observations

SBID	Project	Date	Duration (hours)	Field Centre	Central Frequency (MHz)
		2019-04-20T01:10:42.4		15:30:00.1524 +28:59:58	1408.83

Image

File: 'image_mf_00.fits'

IMAGE SIZE (pixels)	PIXEL SIZE (arcsec)	Synthesised Beam (arcsec)	Median r.m.s. (uJy)	Image peak (Jy)	Image DR	Source DR	Local DR	Sky Area (deg ²)	Normaltest
3073x3073	4.0	29.2 x 11.1	35	0.01	198	56 - 125	7 - 12	11.66	Passed

Catalogue

File: 'image_mf_00_pybdsf_comp.csv'

Source Finder	Flux Type	Number of sources ($\geq 5.0\sigma$)	Multi-component islands	Sum of image flux vs. sum of catalogue flux	Median in-band spectral index	Median int/peak flux	Source Counts χ_{red}^2

Transfer data from hannill_01.cctm.nl

Continuum images QA

- Check images
- Continuum validation tool from Jordan Collier, adapted
- Need to automate reporting of statistics

preflag crosscal continuum selfcal line mosaic apercal_log [For help check OSA Guide](#) [List of Observations](#)

Right Ascension 15h38m 32m 28m 24m 0.0 Right Ascension

Validation Tool

APERTIF Continuum Data Validation Report

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Transfer data from hannill_01.cctm.nl

Continuum images QA

- Check images
- Continuum validation tool from Jordan Collier, adapted
- Need to automate reporting of statistics

Summary of data quality

File Edit View Insert Format Data Tools Add-ons Help Last edit was yesterday at 4:00 PM

100% \$ % .0 .00 123 Arial 10 B I A

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA			
2	OSA	taskID	Field	Notes	#F	min	max	med	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
3	Betsy	190315128	T1509+60	8-bit	3	26	126	63	40	91	82	49	59	53	63	73	117	113	76	60	116	49	55	71	41	49	4			
4	Betsy Adams	190326001	S2148+31	12,32 also failed	22	42	304	70.5	F	F	81	F	61	95	63	F	F	F	F	F	F	34	60	65	F	F	75	14		
5	Kelley Hess	190326042	M1204+58	nothing created	22	33	112	49	96	43	46	F	36	33	F	F	F	F	F	F	F	42	F	112	45	49	F	F	64	5
6	Thija van der Hul	190327001	S0001+29		11	33	2061	64	104	43	86	F	35	33	46	1353	F	1136	37	F	112	48	52	F	5123	60	5			
7	Danielle Lucero	190327042	M1426+50		18	39	257	72	F	50	227	56	F	88	107	F	77	117	F	197	117	121	F	F	F	257	F	F		
8	Helga Denes	190328001	M0208+33		17	41	1369	69	F	54	323	58	F	118	F	F	73	118	F	263	136	149	F	F	405	F	F			
9	Bjorn Acebahr	190329001	S2148+36		24	38	391	71.5	F	F	F	97	67	F	F	F	391	132	F	63	173	F	F	70	F	46	5			
10	Erwin de Blok	190329042	S1225+50		12	33	1421	95.5	F	5992	5174	83	86	F	F	201	86	151	F	70	165	10985	254	89	F	46	5			
11	Alexander Kutkin	190330001	S0003+41		18	34	389	93	F	F	F	78	63	F	F	F	84	209	F	78	166	F	389	93	F	F	5			
12	Marc Verheijen	190330042	M1426+50		0	0	0	#NUM!																						
13	Raffaella Morgar	190331001	S0220+29		16	37	813	118.5	F	68	150	F	F	329	F	453	158	F	F	238	430	F	F	87	69	F	56			
14	Week 2																													
15	Betsy Adams	190409015	S2248+33	190409015	11	27	414	33	F	50	37	414	34	33	35	41	44	34	31	F	32	36	44	34	32	30	3			
16	Alexander Kutkin	190409058	M1403+53	190409058	11	27	104	35	F	42	35	F	F	44	F	F	35	31	F	30	40	104	57	32	38	37	6			
17	Raffaella Morgar	190410001	M0155+33	190410001	0	0	0	#NUM!																						
18	Bjorn Acebahr	190411001	S2246+38	190411001	0	0	0	#NUM!																						
19	Marc Verheijen	190411042	S1415+36	190411042	0	0	0	#NUM!																						
20	Erwin de Blok	190412001	M0141+33	190412001	0	0	0	#NUM!																						
21	Helga Denes	190413001	S2250+41	190413001	0	0	0	#NUM!																						
22	Kelley Hess	190413042	S1429+36	190413042	0	0	0	#NUM!																						
23	Danielle Lucero	190414001	M0155+33	190414001	0	0	0	#NUM!																						
24																														
25	Week 1				min	0	0	#NUM!	96	43	46	56	35	33	46	201	73	117	37	63	112	45	49	89	69	48	5			
26					max	42	2961	#NUM!	104	5992	5174	97	87	329	107	1353	391	1136	42	263	430	10985	389	93	5123	75	56			
27					med	34	389	#NUM!	100	52	150	83	82	91.5	63	453	85	141.5	39.5	137.5	150.5	90.5	65	78.5	331	60	5			
28					# failed				7	3	2	4	3	3	6	6	3	3	7	3	0	3	4	5	5	3				
29																														
30	Week 2				min	0	0	#NUM!	0	42	36	414	34	33	35	41	35	31	31	30	32	36	44	32	32	30	3			
31					max	27	414	#NUM!	0	50	37	414	34	44	35	41	44	34	31	30	40	104	57	34	38	37	6			
32					med	0	0	#NUM!	#NUM!	46	36	414	34	38.5	35	41	39.5	32.5	31	30	36	69.5	50.5	33	35	33.5	46			

Mosaicked continuum images QA

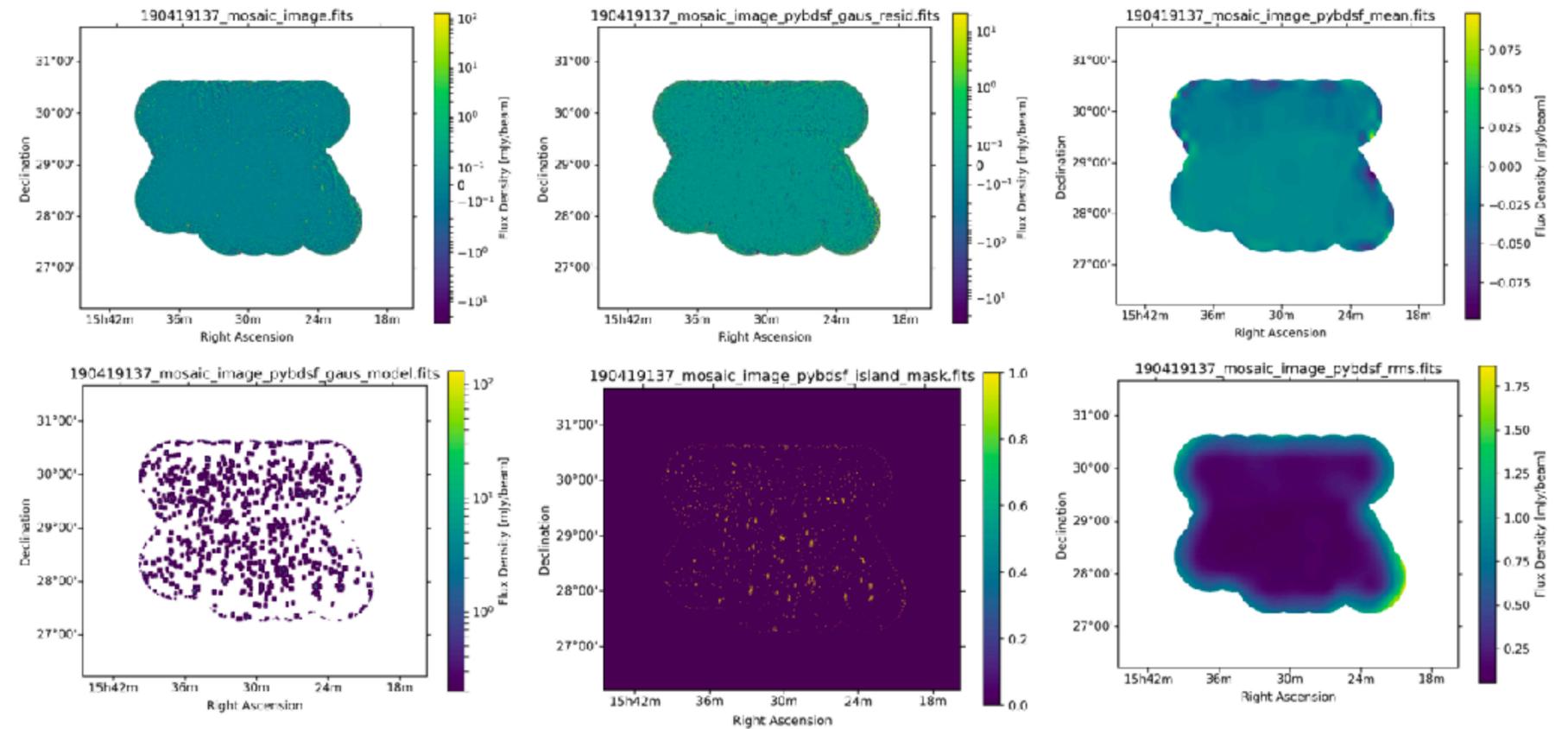
- Same as individual beam images
- Mosaicking done with linmos by Helga Dénes
- Needs to be done properly

preflag crosscal continuum selfcal line mosaic apercal_log [For help check OSA Guide](#) [List of Observations](#)

Here you can inspect the continuum image, PyBDSF diagnostic plots and the validation tool for the mosaic of all available beam images. The PyBDSF catalog is not accessible from this page, but can be found in the QA directory as a csv table.

This page will only have content after the mosaic was created and the mosaic QA step has been performed.

PyBDSF Diagnostic plots

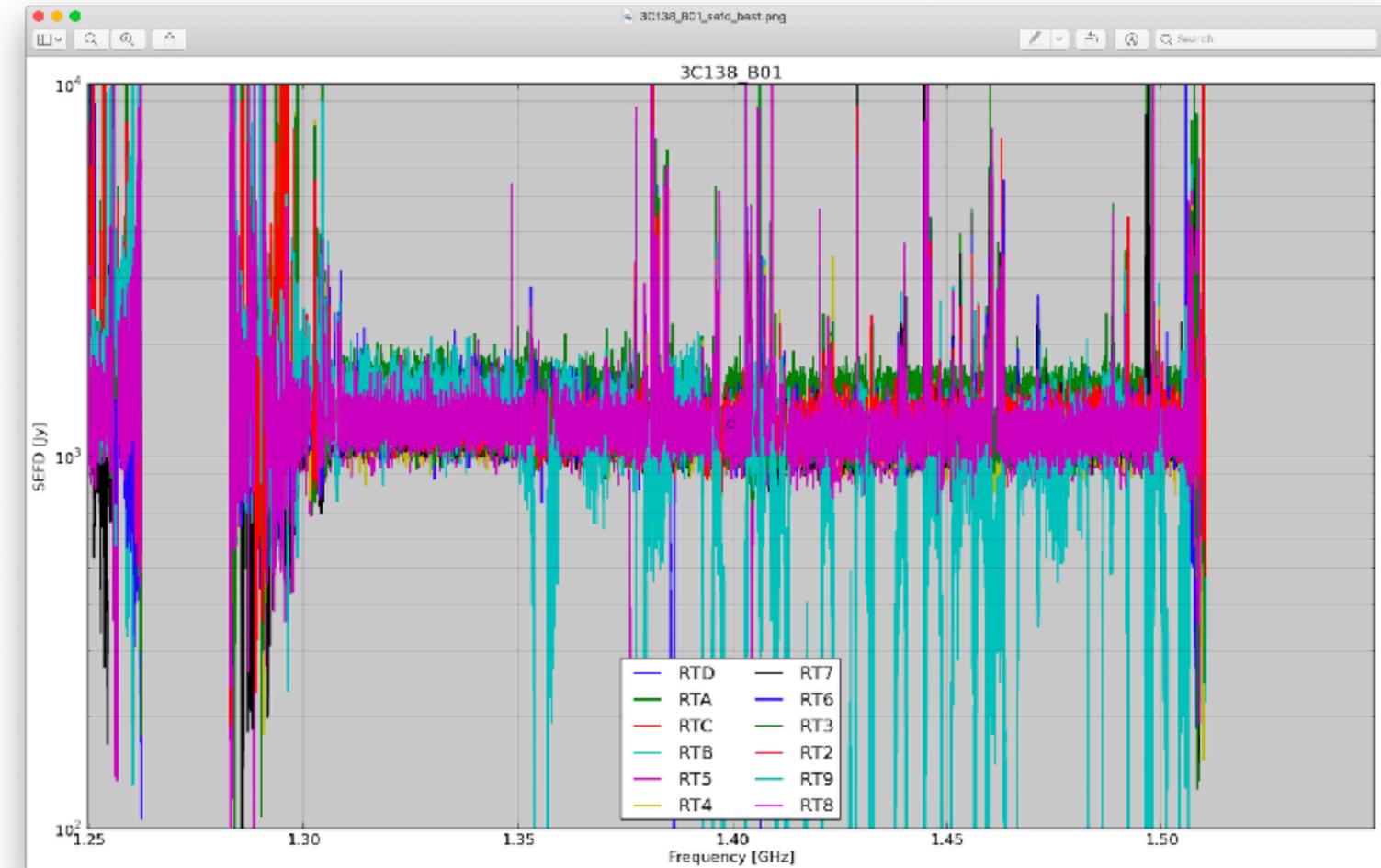


Validation Tool

190419137_mosaic_image_pybdsf_gaus_resid.fits

Connection to SPARCS

- Use of continuum validation tool by Jordan Collier
- RFInder by Filippo Maccagni
- Want to adapt/incorporate SEFD calculations from Javier Moldon
 - Code runs but not in Apercal context (personal laptop)
 - Calibrator field but should be blank field (don't believe SEFD values)



Connection to PHISCC

- Pathfinder HI Surveys Coordination Committee
- HI surveys rely on continuum for calibration
- Validating continuum is first step to validating line data
 - Accurate continuum subtraction
- Connect HI QA - build on what SPARCS does
 - Informal PHISCC QA working group to connect to SPARCS QA and expand to spectral line

Next steps

- Integrating QA into pipeline
 - Have some internal QA (upcoming talk by Björn)
 - Want to incorporate post-facto QA shown here, specifically cross-calibration and self-calibration solutions
- Automate post-pipeline QA
 - Extremely manual for SVC
 - Running of scripts plus collection of output
- Polarization (and line) QA development
- Quicklook pipeline
- Development within SPARCS context