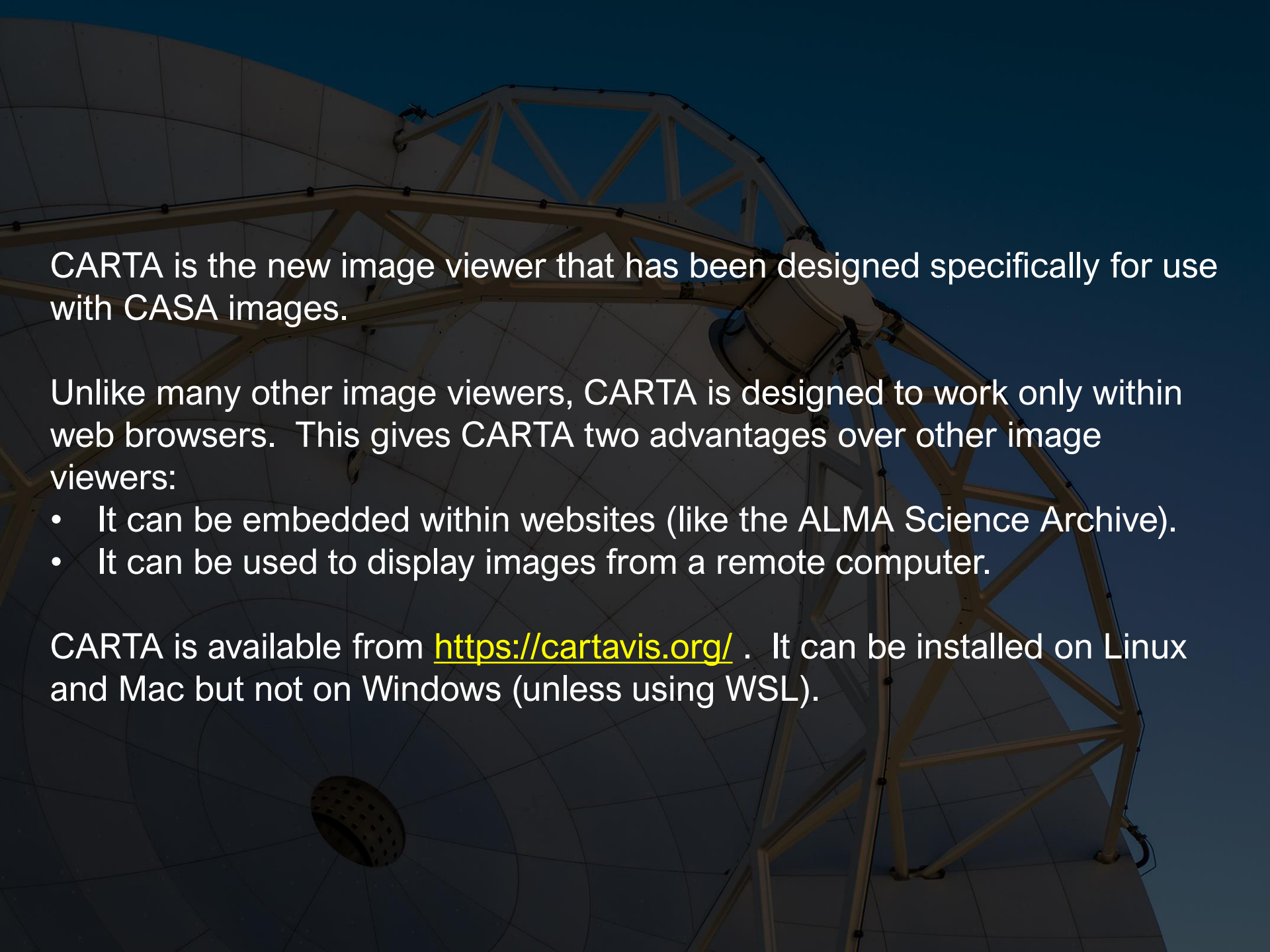


# ***CARTA***

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CARTA is the new image viewer that has been designed specifically for use with CASA images.

Unlike many other image viewers, CARTA is designed to work only within web browsers. This gives CARTA two advantages over other image viewers:

- It can be embedded within websites (like the ALMA Science Archive).
- It can be used to display images from a remote computer.

CARTA is available from <https://cartavis.org/> . It can be installed on Linux and Mac but not on Windows (unless using WSL).

When CARTA is started, it will display a file browser window. When a file is selected in this interface, CARTA will display useful information about the image.

The screenshot displays the CARTA web interface. A file browser window is open, showing a list of files in a table. The table has columns for Filename, Type, Size, and Date. The files listed are FITS files with various names and sizes, all dated 17:54. The file browser also includes a search bar and a 'Filter by filename with fuzzy search' option. The main workspace behind the file browser shows 'No image loaded' and 'No file loaded' messages, along with a 'Load a file using the menu' instruction.

Filename	Type	Size	Date
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.cube.l	FITS	714.2 kB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.cube.l	FITS	198.8 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.cube.l	FITS	731.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.mfs.l.r	FITS	9.7 kB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.mfs.l.f	FITS	1.7 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.mfs.l.f	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23_	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23_	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23_	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23_	FITS	9.9 kB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23_	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23_	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23_	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw21.cube.l	FITS	165.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw21.cube.l	FITS	731.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw21.mfs.l.r	FITS	9.6 kB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw21.mfs.l.f	FITS	1.4 MB	17:54

When CARTA is started, it will display a file browser window. When a file is selected in this interface, CARTA will display useful information about the image.

The screenshot shows the CARTA software interface. A file browser window is open, displaying a list of files in the directory `mnt > d > product`. A yellow arrow points to the file `member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23.fits`, which is highlighted in blue. To the right of the file browser, a 'File Information' panel is visible, showing details for the selected file. The main window behind the browser shows 'No image loaded' and a 'Render Configuration' panel.

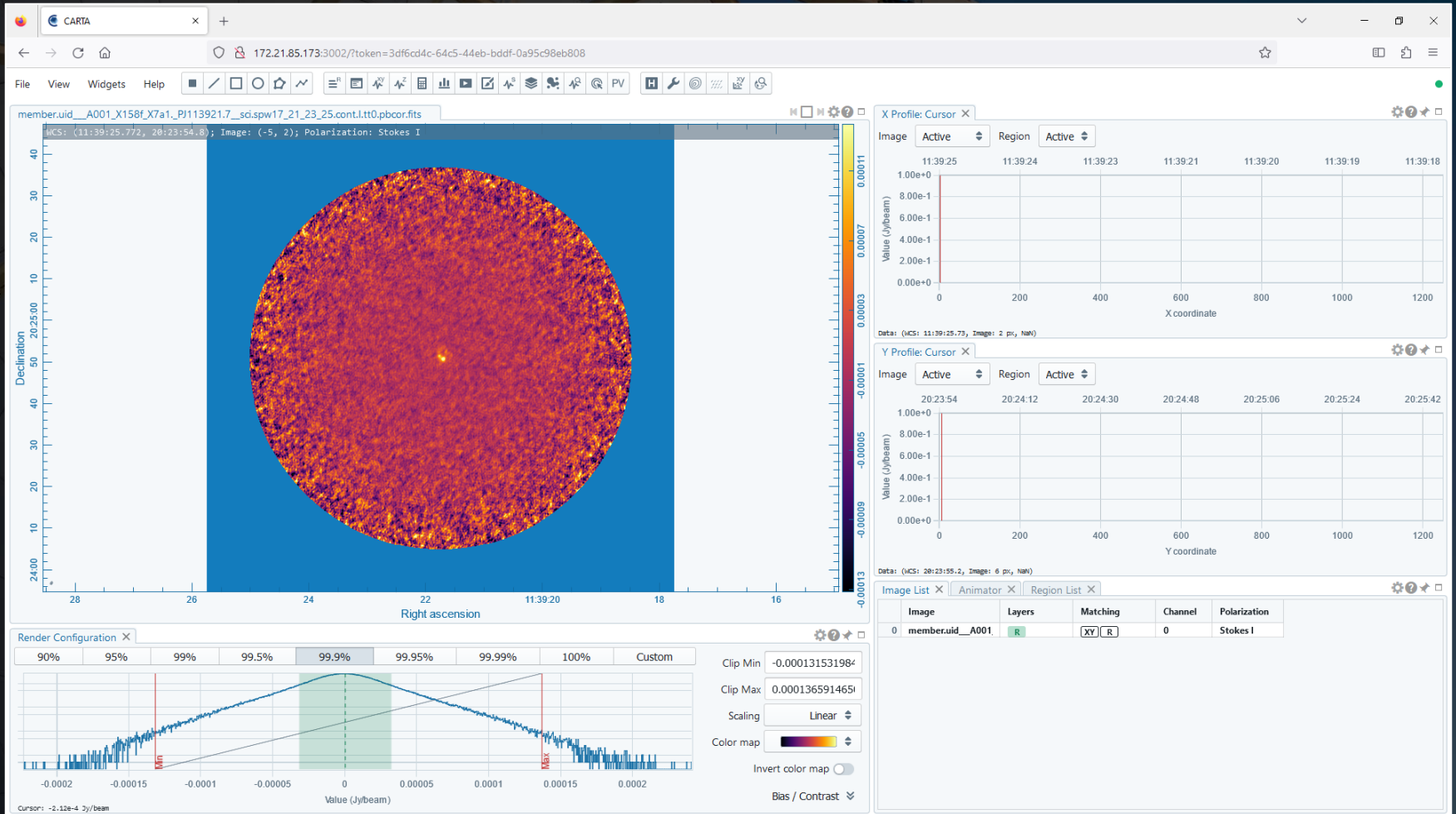
Filename	Type	Size	Date
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.cube.l	FITS	714.2 kB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.cube.l	FITS	198.8 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.cube.l	FITS	731.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.mfs.l.r	FITS	9.7 kB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17.mfs.l.r	FITS	1.7 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23	FITS	9.9 kB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw17_21_23	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw21.cube.l	FITS	165.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw21.cube.l	FITS	731.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw21.mfs.l.r	FITS	9.6 kB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw21.mfs.l.r	FITS	1.4 MB	17:54

**File Information**

Name = member.uid\_\_A001\_X158f\_X7a1\_P1113921.7\_sci.spw17\_21\_23\_25.coo  
HDU = 0  
Data type = float  
Shape = [1250, 1250, 1, 1]  
Number of channels = 1  
Number of polarizations = 1  
Coordinate type = Right Ascension, Declination  
Projection = SIN  
Image reference pixels = [626, 626]  
Image reference coords = [11:39:21.7420, +020.24.50.9005]  
Image ref coords (deg) = [174.841 deg, 20.4141 deg]  
Pixel increment = -0.09", 0.09"  
Pixel unit = Jy/beam  
Celestial frame = ICRS  
Spectral frame = LSRK  
Velocity definition = RADIO  
Restoring beam = 0.792553" X 0.495623", -28.4605 deg  
RA range = [11:39:17.747, 11:39:25.744]  
DEC range = [20:23:54.648, 20:25:47.081]



Once a file is selected, It will be possible to see CARTA's main display.

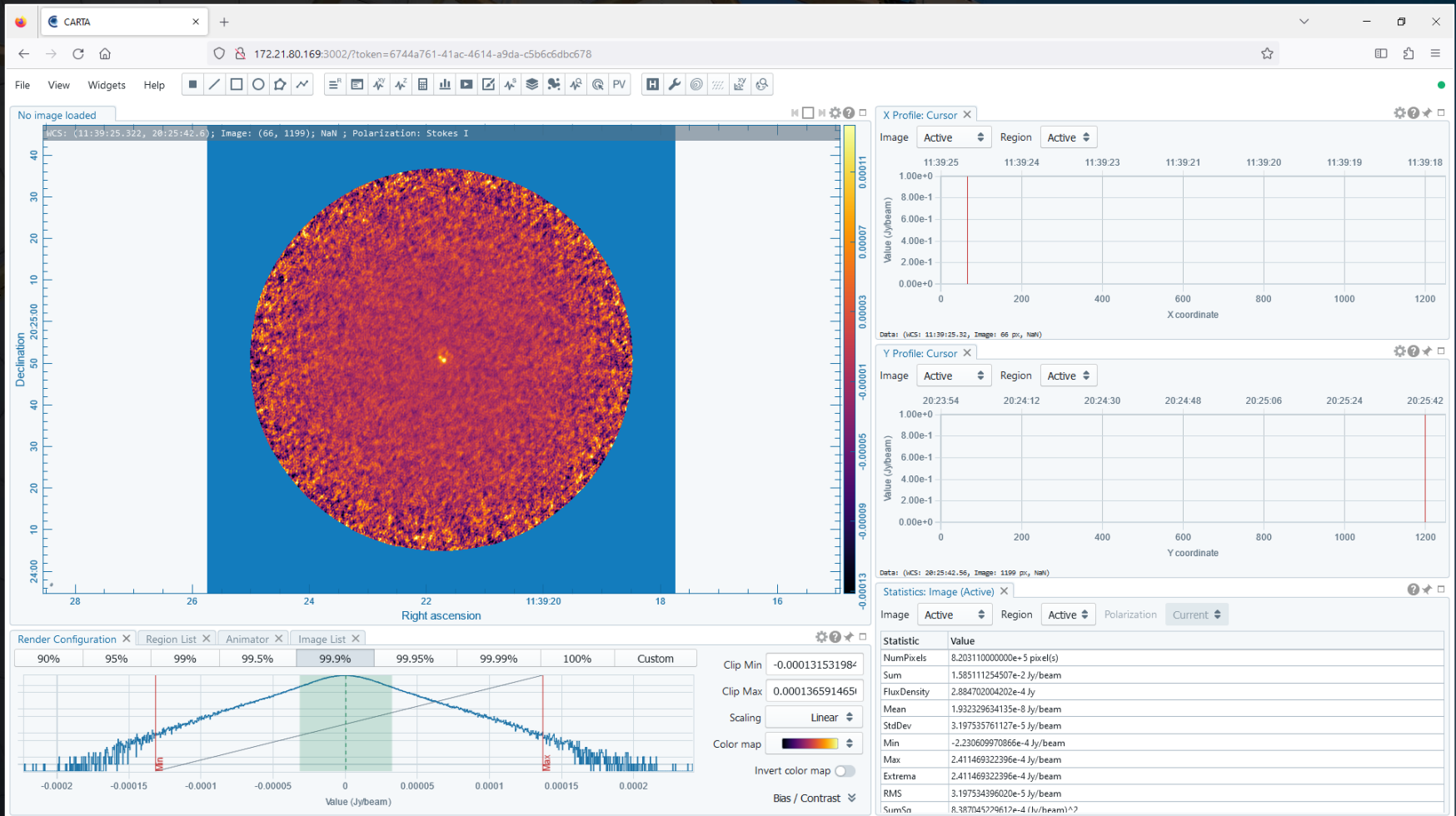


The default display features the image panel and six widgets. It is possible to select alternate panel arrangements by going to View and then Layouts in the menu bar at the top.

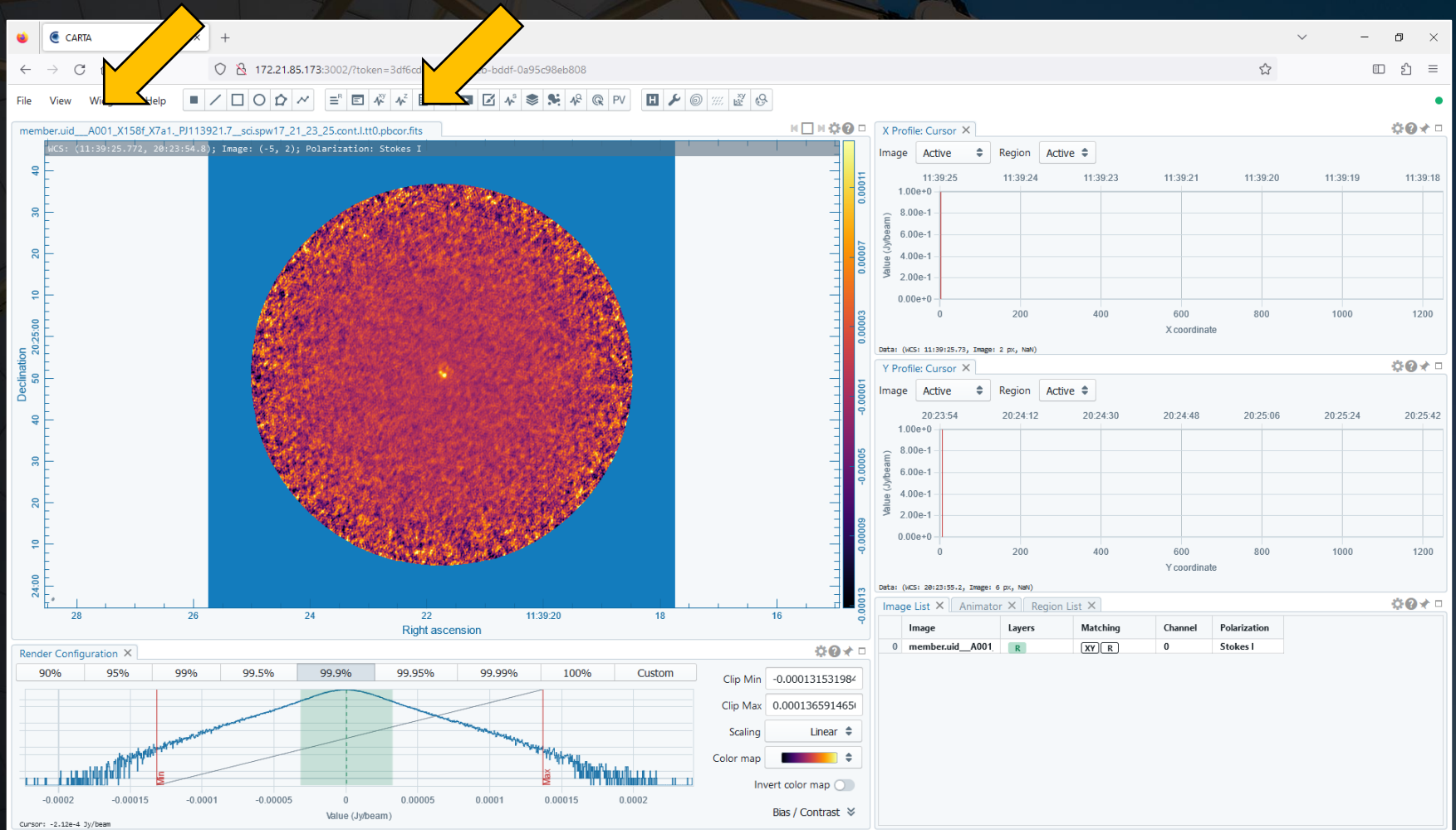
The screenshot displays the CARTA software interface. A yellow arrow points to the 'View' menu in the top-left corner. The main display area shows a circular radio telescope image with a color scale on the right. Below the image is a histogram and a 'Render Configuration' panel with various settings like 'Clip Min', 'Clip Max', 'Scaling', and 'Color map'. On the right side, there are two profile plots (X and Y) and an 'Image List' table.

Image	Layers	Matching	Channel	Polarization		
0	memberuid__A001	R	XY	R	0	Stokes I

The default display features the image panel and six widgets. It is possible to select alternate panel arrangements by going to View and then Layouts in the menu bar at the top.



It is also possible to open new widgets by clicking on the various corresponding buttons in the button bar or by clicking on one of the options under Widgets in the menu bar.





It is also possible to open new widgets by clicking on the various corresponding buttons in the button bar or by clicking on one of the options under Widgets in the menu bar.

The screenshot displays the CARTA software interface. The main window shows a radio astronomy image of a circular source. A 'Statistics: Image (Active)' window is open, displaying the following data:

Statistic	Value
NumPixels	8.203110000000e+5 pixel(s)
Sum	1.585111254507e-2 Jy/beam
FluxDensity	2.884702004202e-4 Jy
Mean	1.932329634135e-8 Jy/beam
StdDev	3.197535761127e-5 Jy/beam
Min	-2.230609970866e-4 Jy/beam
Max	2.411469322396e-4 Jy/beam
Extrema	2.411469322396e-4 Jy/beam
RMS	3.197534396020e-5 Jy/beam
SumSq	8.387045229612e-4 (Jy/beam)^2

Below the image, a histogram shows the distribution of values. The histogram has a 'Render Configuration' window above it with the following settings:

- Clip Min: -0.000131531984
- Clip Max: 0.0001365914651
- Scaling: Linear
- Color map: (Color bar visible)
- Invert color map:
- Bias / Contrast:

On the right side, there are three profile plots:

- X Profile: Cursor X**: Shows a plot of Value (Jy/beam) vs X coordinate. The data points are mostly zero, with a small peak at X=0.
- Y Profile: Cursor X**: Shows a plot of Value (Jy/beam) vs Y coordinate. The data points are mostly zero, with a small peak at Y=0.
- Image List X**: A table showing the current image configuration.

Image	Layers	Matching	Channel	Polarization		
0	member.aid_A001	R	XY	R	0	Stokes I

Widgets can be dragged around the screen by moving the cursor over the menu bar and holding down the left mouse button.

The screenshot displays the CARTA software interface. The main window shows a radio astronomy image with a color scale on the right. A yellow arrow points to the 'Statistics: Image (Active)' widget, which is a floating window containing a table of statistical data. Below the main image, there is a 'Render Configuration' widget with a histogram and various settings. To the right, there are 'X Profile: Cursor' and 'Y Profile: Cursor' widgets, each showing a line graph of intensity versus coordinate. At the bottom right, there is an 'Image List' widget with a table of loaded images.

**Statistics: Image (Active)**

Statistic	Value
NumPixels	8.203110000000e+5 pixel(s)
Sum	1.585111254507e-2 Jy/beam
FluxDensity	2.884702004202e-4 Jy
Mean	1.932329634135e-8 Jy/beam
StdDev	3.197535761127e-5 Jy/beam
Min	-2.230609970866e-4 Jy/beam
Max	2.411469322396e-4 Jy/beam
Extrema	2.411469322396e-4 Jy/beam
RMS	3.197534396020e-5 Jy/beam
SumSq	8.387045229612e-4 (Jy/beam) <sup>2</sup>

**Render Configuration**

Clip Min: -0.000131531984  
Clip Max: 0.0001365914651  
Scaling: Linear  
Color map: [Color bar]  
Invert color map:   
Bias / Contrast: [icon]

**Image List**

Image	Layers	Matching	Channel	Polarization
0 memberuid_A001	R	XY R	0	Stokes I

Widgets can be dragged around the screen by moving the cursor over the menu bar and holding down the left mouse button.

The screenshot displays the CARTA software interface. The main window shows a circular radio telescope image with a color scale on the right ranging from -0.0013 to 0.0011. The axes are labeled 'Right ascension' and 'Declination'. A 'Render Configuration' panel at the bottom left shows a histogram of the image data with a green shaded region and a red vertical line. A 'Statistics: Image (Active)' window is open, displaying various statistical values for the image. A yellow arrow points to the 'Statistics: Image (Active)' window. The interface also includes a 'Clip Min' and 'Clip Max' panel, a 'Scaling' panel, and an 'Image List' panel at the bottom right.

Statistics: Image (Active)

Statistic	Value
NumPixels	8.203110000000e+5 pixel(s)
Sum	1.585111254507e-2 Jy/beam
FluxDensity	2.884702004202e-4 Jy
Mean	1.932329634135e-8 Jy/beam
StdDev	3.197535761127e-5 Jy/beam
Min	-2.230609970866e-4 Jy/beam
Max	2.411469322396e-4 Jy/beam
Extrema	2.411469322396e-4 Jy/beam
RMS	3.197534396020e-5 Jy/beam
SumSq	8.387045229612e-4 (Jy/beam) <sup>2</sup>

Image List

Image	Layers	Matching	Channel	Polarization		
0	memberuid__A001	R	XY	R	0	Stokes I



Widgets can be fixed into place by moving the cursor over the pin icon, holding down the left mouse button, and then dragging the outline around CARTA. Widgets can be placed either in between other widgets or in the same place as others (with the widget selected using the tabs).

The screenshot displays the CARTA software interface. The main window shows a radio telescope image with a color scale on the right. A yellow arrow points to a pin icon in the top right corner of the image area. A 'Statistics: Image (Active)' window is open, displaying the following data:

Statistic	Value
NumPixels	8.203110000000e+5 pixel(s)
Sum	1.585111254507e-2 Jy/beam
FluxDensity	2.884702004202e-4 Jy
Mean	1.932329634135e-8 Jy/beam
StdDev	3.197535761127e-5 Jy/beam
Min	-2.230609970866e-4 Jy/beam
Max	2.411469322396e-4 Jy/beam
Extrema	2.411469322396e-4 Jy/beam
RMS	3.197534396020e-5 Jy/beam
SumSq	8.387045229612e-4 (Jy/beam)^2

Below the image, there is a 'Render Configuration' window showing a histogram of the image values. The histogram has a green shaded region around the mean and red vertical lines for the minimum and maximum values. The 'Clip Min' is set to -0.000131531984 and the 'Clip Max' is 0.0001365914651. The 'Scaling' is set to 'Linear' and the 'Color map' is a rainbow spectrum. The 'Bias / Contrast' is also visible.

On the right side, there are two profile windows: 'X Profile: Cursor X' and 'Y Profile: Cursor X'. Both show a plot of 'Value (Jy/beam)' versus 'X coordinate' or 'Y coordinate'. The 'X Profile' has a data table with columns for X coordinate and Value (Jy/beam). The 'Y Profile' has a data table with columns for Y coordinate and Value (Jy/beam).

At the bottom right, there is an 'Image List' window with a table showing the current image configuration:

Image	Layers	Matching	Channel	Polarization		
0	memberuid_A001	R	XY	R	0	Stokes I



Widgets can be fixed into place by moving the cursor over the pin icon, holding down the left mouse button, and then dragging the outline around CARTA. Widgets can be placed either in between other widgets or in the same place as others (with the widget selected using the tabs).

The screenshot displays the CARTA software interface. The main window shows a circular radio telescope image with a color scale on the right ranging from -0.0013 to 0.0011. The axes are labeled 'Right ascension' and 'Declination'. Below the image is a histogram showing the distribution of values, with a green shaded region indicating a selected range. The histogram has a 'Min' and 'Max' label. To the right of the histogram are controls for 'Clip Min', 'Clip Max', 'Scaling' (set to Linear), 'Color map', and 'Bias / Contrast'.

On the right side of the interface, there are two profile plots: 'X Profile: Cursor X' and 'Y Profile: Cursor X'. Both plots show 'Value (Jy/beam)' on the y-axis and 'X coordinate' or 'Y coordinate' on the x-axis. A yellow arrow points to a pin icon in the bottom right corner of the Y Profile plot, which is used to fix widgets in place.

At the bottom right, there is a table with the following data:

Image	Active	Region	Polarization
Cursor	Point		

Below the table, there is a 'Statistic Value' section with the following data:

Statistic	Value
NumPixels	8.203110000000e+5 pixel(s)
Sum	1.585111254507e-2 Jy/beam
FluxDensity	2.884702004202e-4 Jy
Mean	1.932329634135e-8 Jy/beam
StdDev	3.197535761127e-5 Jy/beam
Min	-2.230609970866e-4 Jy/beam
Max	2.411469322396e-4 Jy/beam
Extrema	2.411469322396e-4 Jy/beam
RMS	3.197534396020e-5 Jy/beam
SumSn	8.387045729617e-4 (Jy/beam)^2

Widgets can be fixed into place by moving the cursor over the pin icon, holding down the left mouse button, and then dragging the outline around CARTA. Widgets can be placed either in between other widgets or in the same place as others (with the widget selected using the tabs).

The screenshot displays the CARTA software interface. The main window shows a circular radio astronomy image with a color scale on the right ranging from -0.0013 to 0.0011. The axes are labeled 'Right ascension' and 'Declination'. Below the image is a histogram showing the distribution of pixel values, with a green shaded region indicating a selected range. The histogram has a 'Cursor' at -2.23e-4 Jy/beam. To the right of the histogram are controls for 'Clip Min', 'Clip Max', 'Scaling' (set to Linear), and 'Color map'. At the bottom right, there is a 'Statistics: Image (Active)' panel with a table of image statistics.

Statistic	Value
NumPixels	8.203110000000e+5 pixel(s)
Sum	1.585111254507e-2 Jy/beam
FluxDensity	2.884702004202e-4 Jy
Mean	1.932329634135e-8 Jy/beam
StdDev	3.197535761127e-5 Jy/beam
Min	-2.230609970866e-4 Jy/beam
Max	2.411469322396e-4 Jy/beam
Extrema	2.411469322396e-4 Jy/beam
RMS	3.197534396020e-5 Jy/beam
SumSd	8.387045229617e-4 (Jy/beam)^2



Left clicking on a question mark will bring up a help screen.

The screenshot shows the CARTA software interface with a help window open for the 'Image List' widget. The help window contains the following text:

The image list widget displays all loaded images as a list, which includes the image name, rendering layers (R for raster, C for contours, V for vector field), layer visibility state, spatial matching state, spectral matching state, color range matching state, channel index, and polarization type. The channel index and polarization type are synchronized with the animator.

You may click R to hide/show a raster layer, C to hide/show a contour layer, and V to hide/show a vector field layer.

Per image, you can click the XY button to enable/disable spatial matching and click the Z button to enable/disable spectral matching. To match the color range to the reference image, click the R button.

To change a reference image, right-click on a row to bring up the context menu. The spatial reference image, the spectral reference image, and the raster scaling reference image can be defined independently. By default, spectral matching is performed with respect to radio velocity convention. If other spectral conventions (e.g., frequency, channel, etc) are desired, use the Matching tab of the image list settings dialog (the cog at the top-right corner of the image list widget).

When images are matched spectrally in the velocity domain, the rest frequency for the frequency-to-velocity conversion per image can be re-defined. This allows you to compare different spectral features efficiently without changing the RESTFRQ header iteratively and permanently. You can right-click on a row to bring up the context menu or use the Rest Frequency tab of the image list settings dialog.

To close an image (or images), right-click on a row to bring up the context menu.

The list order reflects the order of the image slider in the animator. When the image viewer is in the multi-panel mode, the list order also determines the image order in the grid layout following the left-right then top-down rule. To change the order, drag-and-drop an image in the list to the desired new position.

The interface also shows a main window with a central image viewer, a color scale, and a table of image settings:

Image	Layers	Matching	Channel	Polarization		
0	member.aid__A001	R	XY	R	0	Stokes I

A yellow arrow points to the help icon (question mark) in the bottom right corner of the image list settings dialog.

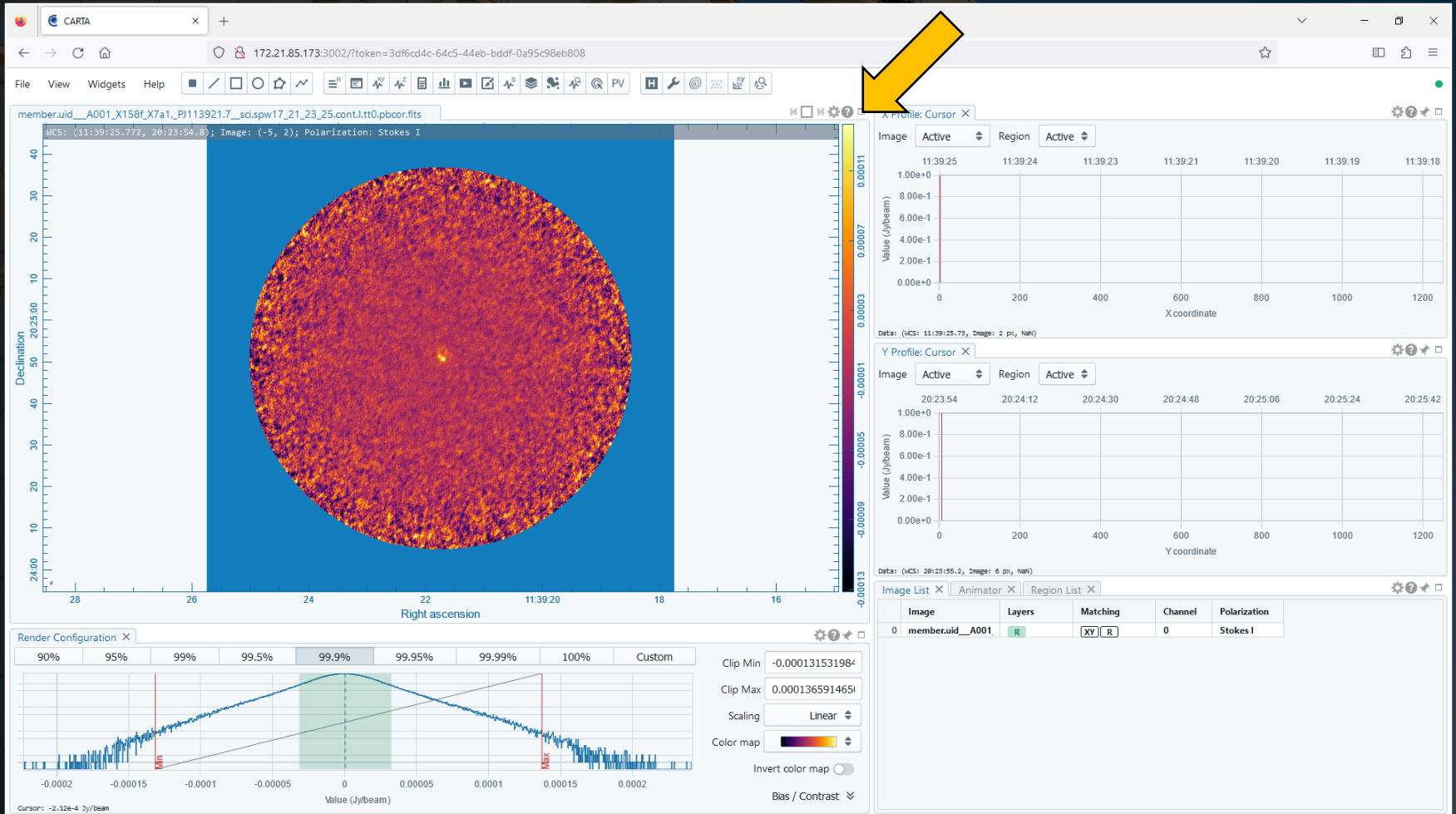
Left clicking on a gear icon will display settings for that window.

The screenshot displays the CARTA web interface. The main window shows a radio galaxy image with a color scale from -0.0013 to 0.0011. A settings dialog for the X Spatial Profile is open, showing options for Styling, Smoothing, and Computation. The X Profile plot shows a peak at approximately X=200. The Y Profile plot shows a peak at approximately Y=200. The histogram at the bottom shows the distribution of values, with a peak at 0. The image list table at the bottom right shows the following data:

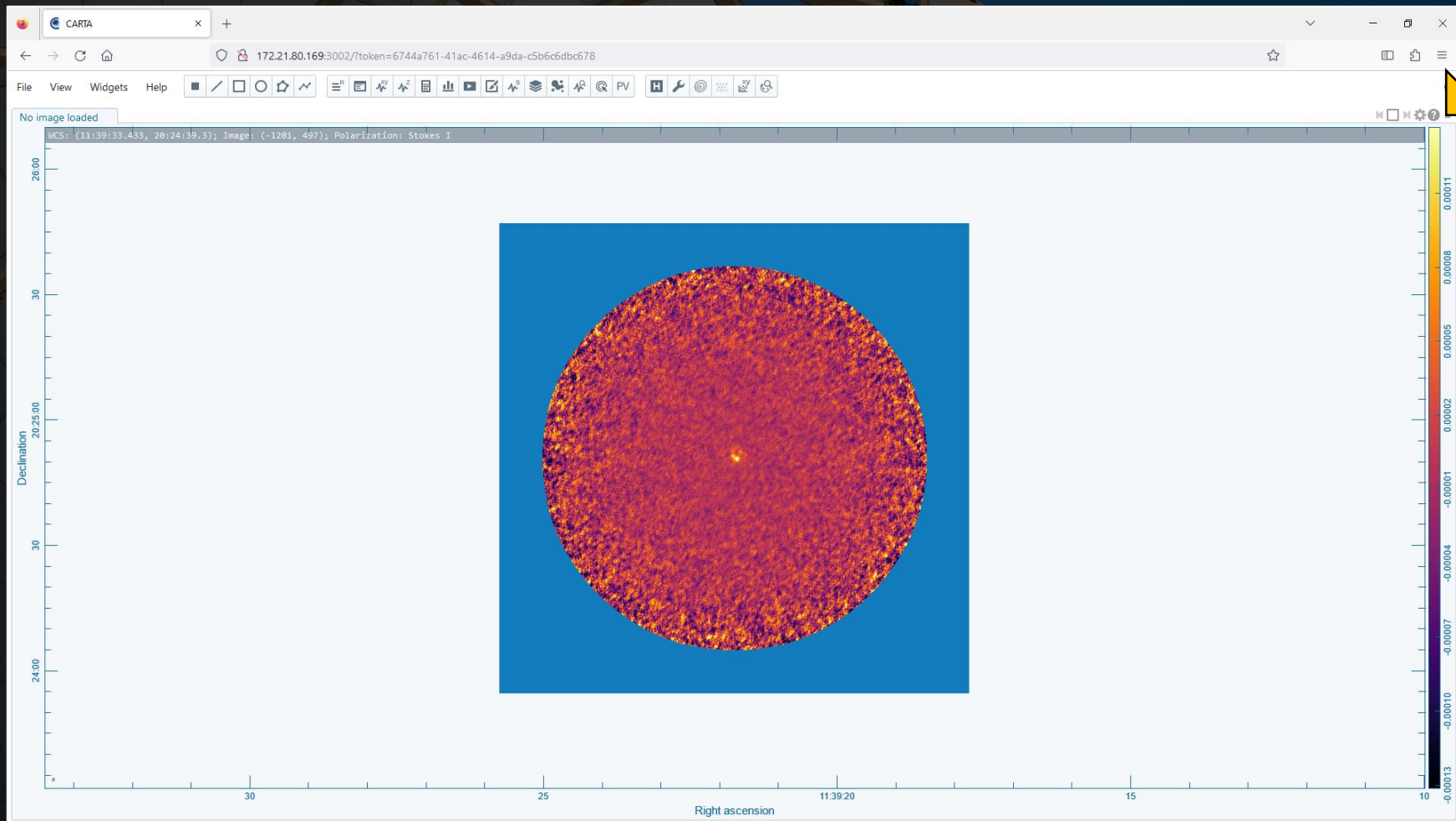
Image	Layers	Matching	Channel	Polarization
0 memberuid_A001	R	XY [R]	0	Stokes I



Left clicking on the rectangle icon will maximize the widget. When a widget is maximized, left clicking on the single bar will restore the widget to its original size.



Left clicking on the rectangle icon will maximize the widget. When a widget is maximized, left clicking on the single bar will restore the widget to its original size.



Various widget configurations can be saved by going to View, then Layouts, and then Save Layout.

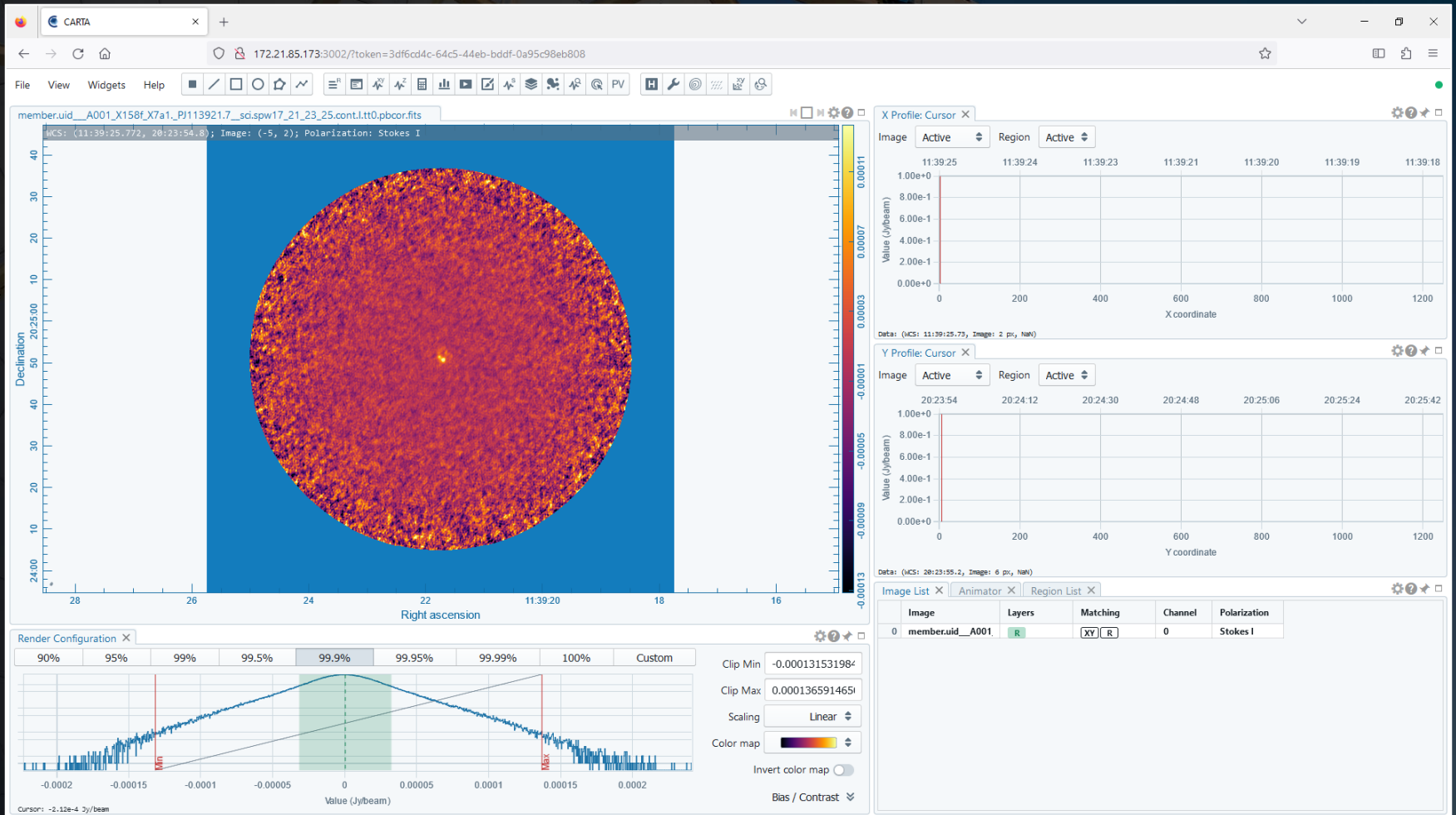
The screenshot displays the CARTA software interface. The main window shows a circular radio telescope beam with a color scale ranging from -0.0013 to 0.0011. The axes are labeled 'Right ascension' and 'Declination'. A yellow arrow points to the 'Layouts' option in the 'View' menu. The interface includes several panels:

- Render Configuration:** A histogram showing the distribution of values, with a green shaded region indicating the current clip range. The x-axis is labeled 'Value (Jy/beam)' and the y-axis is labeled 'Count'. The current clip range is from -0.000131531984 to 0.0001365914651.
- Clip Min:** -0.000131531984
- Clip Max:** 0.0001365914651
- Scaling:** Linear
- Color map:** A color bar showing the mapping of values to colors.
- Invert color map:** A toggle switch.
- Bias / Contrast:** A control for adjusting the image's appearance.

The interface also features two profile plots (X and Y) and an Image List table.

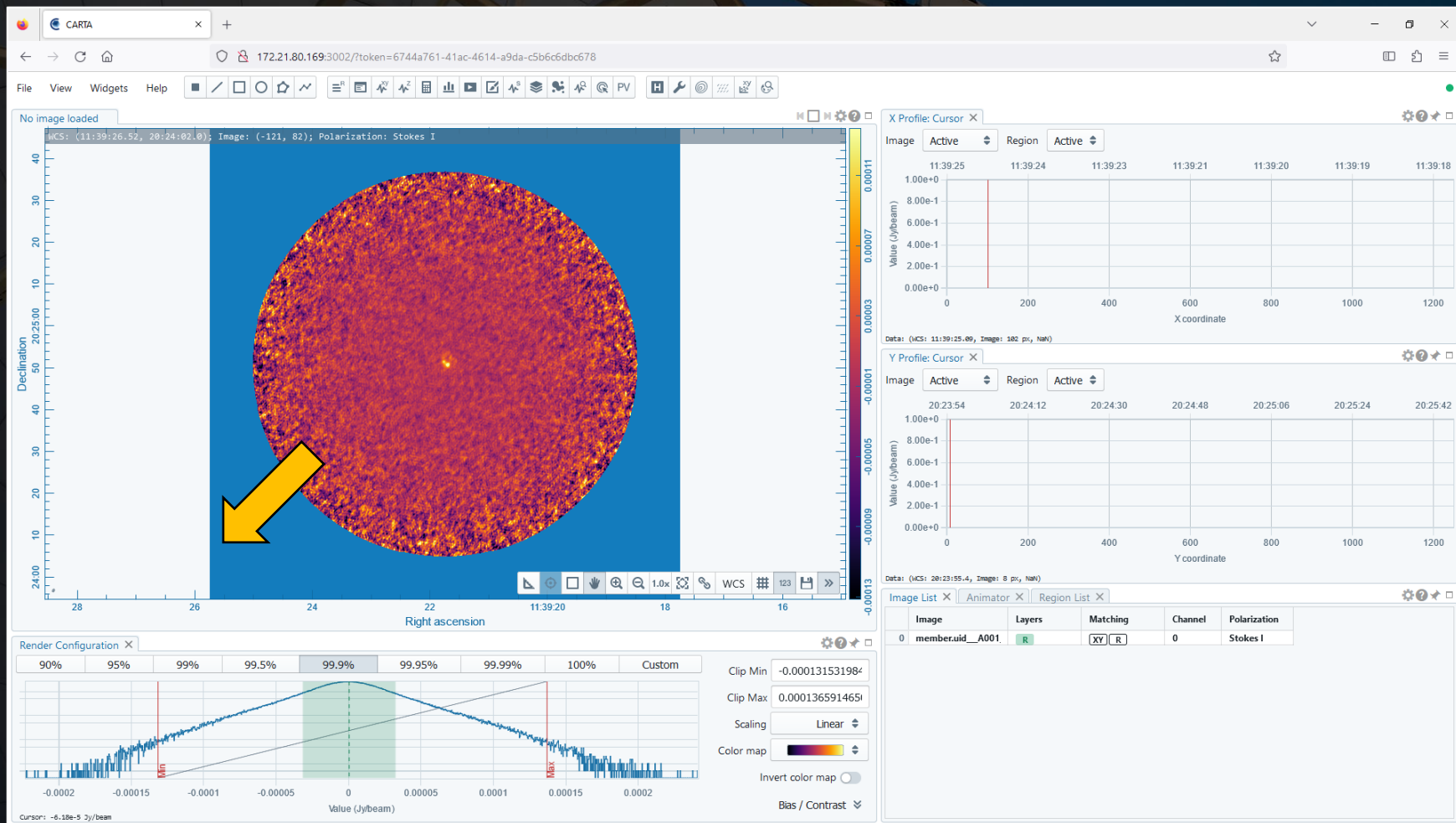
Image	Layers	Matching	Channel	Polarization		
0	memberuid__A001	R	XY	R	0	Stokes I

In the image panel, text at the top shows the coordinates and pixel value at the location of the cursor. The beam is visible by default in the lower left corner. The colour bar is shown on the right. Additional display tools will appear on the lower right when hovering the cursor over the window.

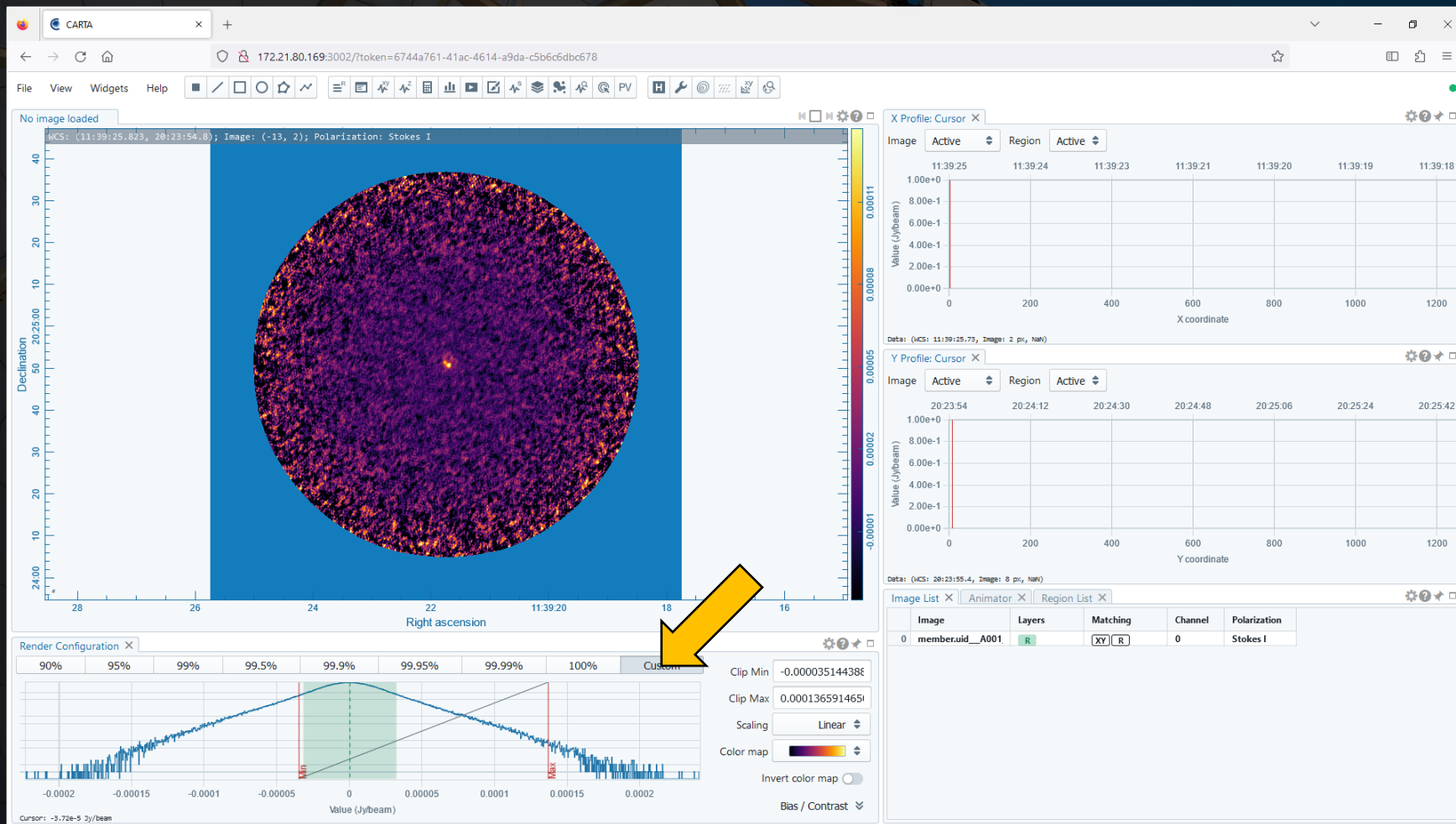




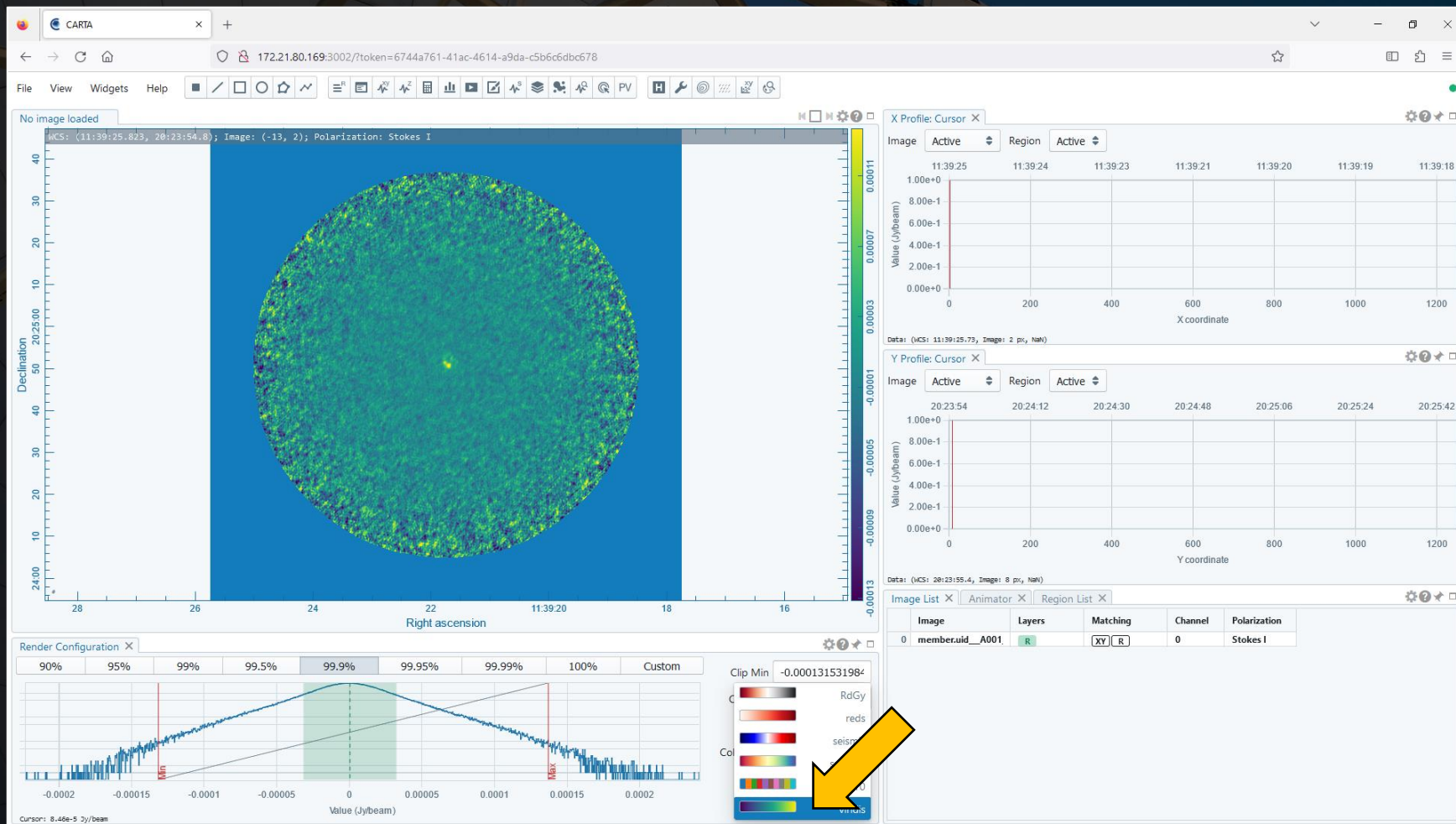
In the image panel, text at the top shows the coordinates and pixel value at the location of the cursor. The beam is visible by default in the lower left corner. The colour bar is shown on the right. Additional display tools will appear on the lower right when hovering the cursor over the window.



The Render Configuration widget at the bottom of the display shows how the pixel values are converted into colours. This can be used to change the minimum and maximum ranges used in the conversion, the scaling function, and the color map.

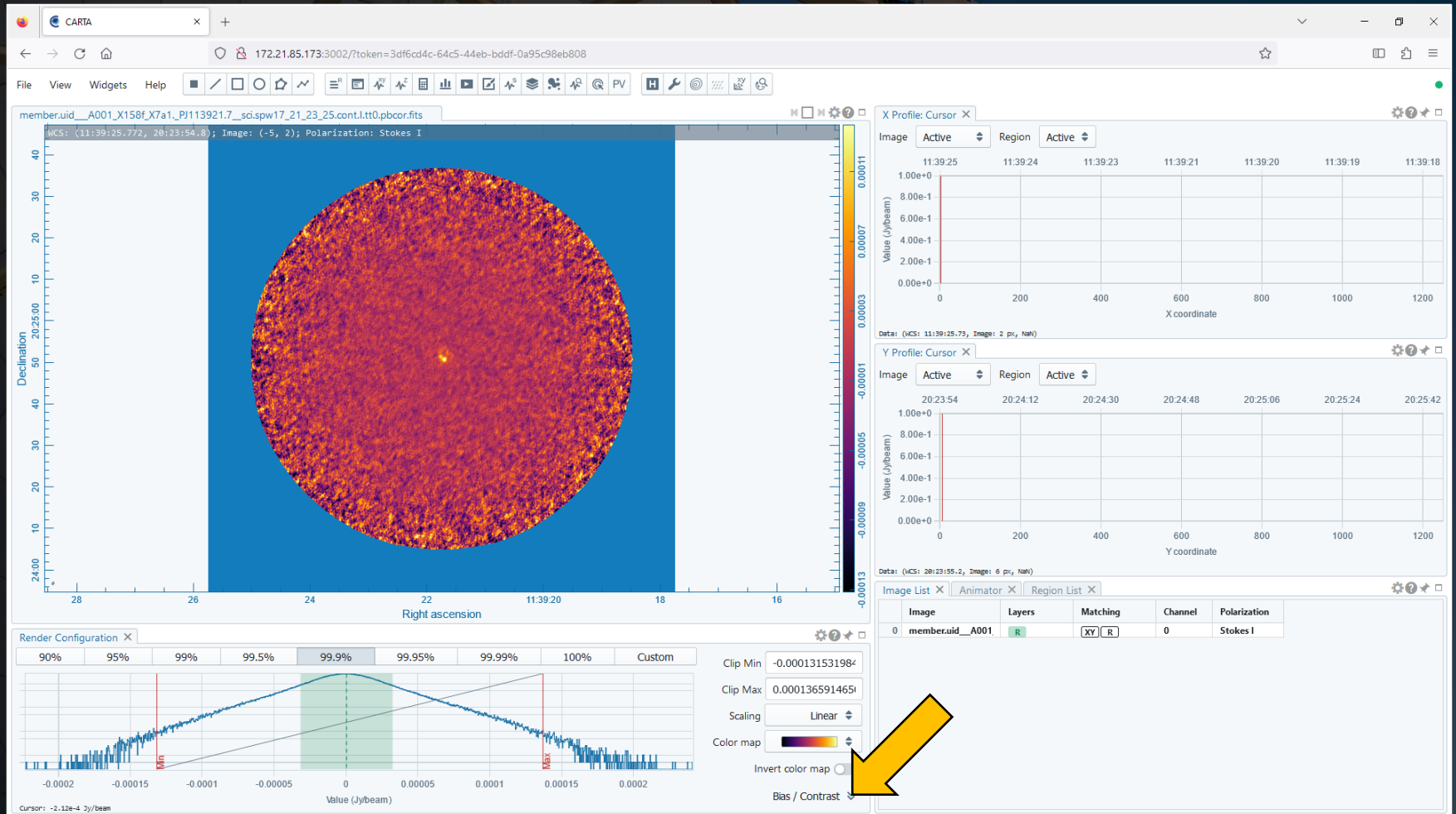


The Render Configuration widget at the bottom of the display shows how the pixel values are converted into colours. This can be used to change the minimum and maximum ranges used in the conversion, the scaling function, and the color map.





Also note that clicking on the arrows next to Bias/Contrast in the Render Configuration widget will display a box with a dot that can be moved around to change the bias and contrast as well as boxes where these values can be typed in.





Also note that clicking on the arrows next to Bias/Contrast in the Render Configuration widget will display a box with a dot that can be moved around to change the bias and contrast as well as boxes where these values can be typed in.

The screenshot displays the CARTA software interface. The main window shows a circular radio astronomy image with a color scale on the right ranging from -0.0013 to 0.0011. The axes are labeled 'Right ascension' and 'Declination'. Below the image is a histogram showing the distribution of values, with a green shaded region indicating the current bias and contrast settings. The histogram has 'Min' and 'Max' markers. To the right of the histogram are controls for 'Bias' (set to 0) and 'Contrast' (set to 1). At the bottom left, the 'Render Configuration' panel shows a list of percentage values (90%, 95%, 99%, 99.5%, 99.9%, 99.95%, 99.99%, 100%, Custom) and a 'Custom' button. On the right side, there are two 'X Profile' and 'Y Profile' plots, each with a grid and axes labeled 'Value (Jy/beam)' and 'X coordinate' or 'Y coordinate'. Below these plots is an 'Image List' table.

Image	Layers	Matching	Channel	Polarization		
0	memberuid_A001	R	XY	R	0	Stokes I

Also note that clicking on the arrows next to Bias/Contrast in the Render Configuration widget will display a box with a dot that can be moved around to change the bias and contrast as well as boxes where these values can be typed in.

The screenshot displays the CARTA software interface. The main window shows a circular radio telescope image with a color scale on the right ranging from -0.00013 to 0.00011. The axes are labeled 'Right ascension' and 'Declination'. Below the image is a histogram showing the distribution of values, with a green shaded region indicating the current bias and contrast settings. The histogram has a cursor at 1.57e-4 Jy/beam. To the right of the histogram are the 'Bias' and 'Contrast' controls, both set to 0.36923 and 1.81538 respectively. A yellow arrow points to the 'Bias' control. At the bottom right, there is a 'Render Configuration' table with columns for Image, Layers, Matching, Channel, and Polarization. The table contains one row with the following values: memberuid\_A001, R, XY, 0, and Stokes I.

Image	Layers	Matching	Channel	Polarization
memberuid_A001	R	XY	0	Stokes I

More than one image can be loaded into CARTA by clicking on File and then Append Image and then selecting a file in the File Browser.

The screenshot displays the CARTA web interface. The browser address bar shows the URL `172.21.80.169:3002/?token=6744a761-41ac-4614-a9da-c5b6c6dbc678`. The File menu is open, with a yellow arrow pointing to the 'Append Image' option. The main view shows a circular image of a star field with a color scale on the right ranging from -0.00013 to 0.00011. Below the image is a 'Render Configuration' panel with a histogram and various settings. On the right side, there are 'X Profile' and 'Y Profile' panels, each showing a graph of 'Value (Jy/beam)' versus coordinate. At the bottom right, an 'Image List' table is visible.

Image	Layers	Matching	Channel	Polarization		
0	member.aid__A001	R	XY	R	0	Stokes I

More than one image can be loaded into CARTA by clicking on File and then Append Image and then selecting a file in the File Browser.

The screenshot displays the CARTA software interface. A File Browser dialog box is open, showing a list of files in the directory `mnt > d > product`. The files are listed with their filenames, types, sizes, and dates. The background shows a FITS image with a color scale and a histogram at the bottom.

Filename	Type	Size	Date
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.cube.l	FITS	714.2 kB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.cube.l	FITS	198.8 MB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.cube.l	FITS	731.3 MB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.mfs.l.r	FITS	9.7 kB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.mfs.l.f	FITS	1.7 MB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.mfs.l.f	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.21_23	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.21_23	FITS	9.9 kB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.21_23	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.21_23	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw17.21_23	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw21.cube.l	FITS	165.3 MB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw21.cube.l	FITS	731.3 MB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw21.mfs.l.r	FITS	9.6 kB	17:54
member.uid__A001_X158f_X7a1_PJ113921.7_sci.spw21.mfs.l.f	FITS	1.4 MB	17:54

The File Browser dialog box also includes a search filter and buttons for "Close" and "Append". The background shows a FITS image with a color scale and a histogram at the bottom.



More than one image can be loaded into CARTA by clicking on File and then Append Image and then selecting a file in the File Browser.

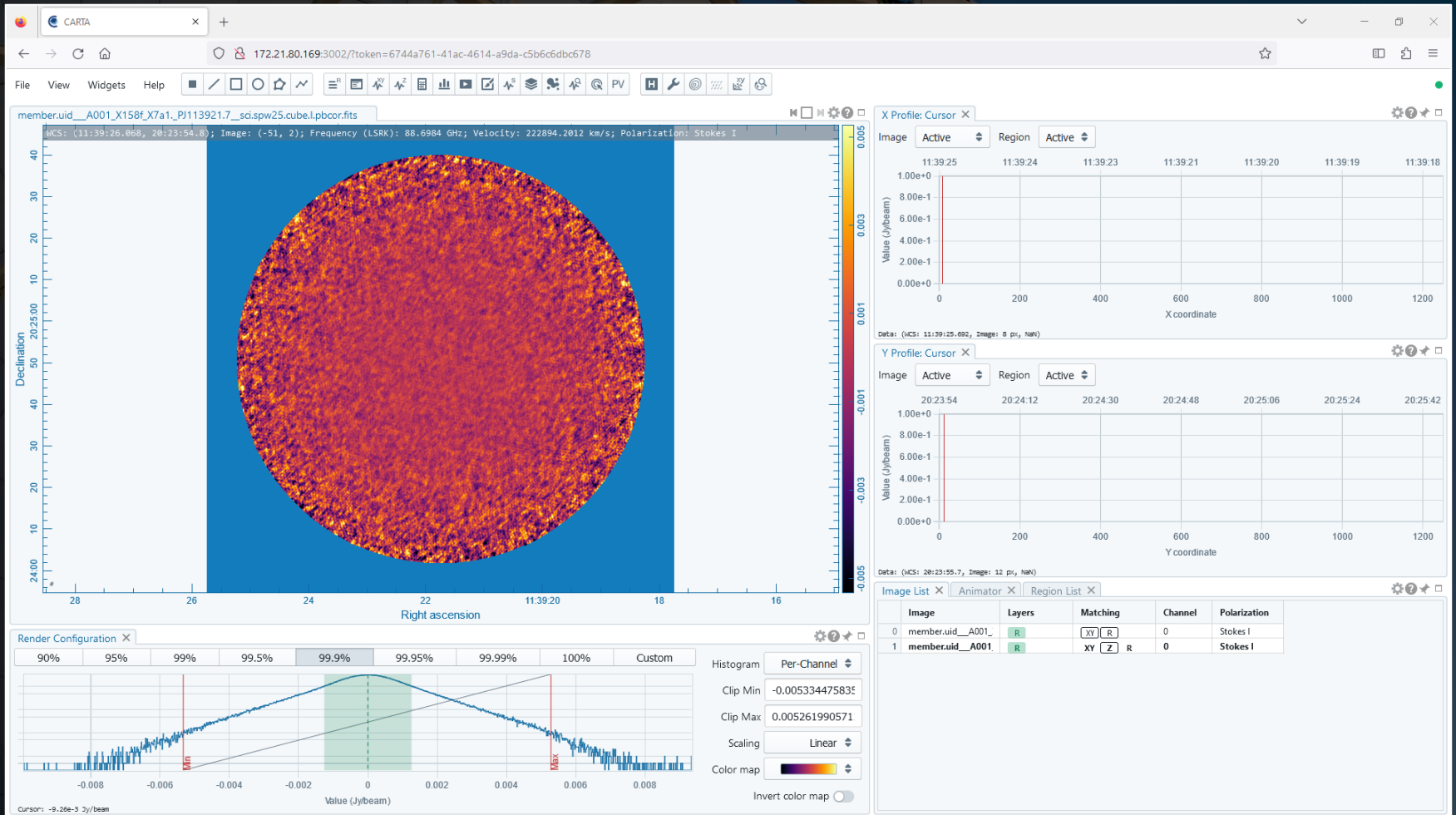
The screenshot displays the CARTA software interface. A File Browser window is open, showing a list of files in the directory `mnt > d > product`. A yellow arrow points to the file `member.uid__A001_X158f_X7a1_P1113921.7_sci.spw25.cube.l`, which is 3.0 GB in size. The File Information panel on the right shows details for this file, including its name, HDU count, data type (float), shape, number of channels (477), number of polarizations (1), coordinate type (Right Ascension, Declination), projection (SIN), image reference pixels, image reference coordinates, image reference coordinates in degrees, pixel increment, pixel unit, celestial frame (ICRS), spectral frame (LSRK), velocity definition (RADIO), restoring beam, and RA range.

Filename	Type	Size	Date
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw1.mfs.l.f	FITS	1.4 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw21.mfs.l.f	FITS	6.3 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw23.cube.l	FITS	161.4 MB	17:54
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw23.cube.l	FITS	731.3 MB	17:55
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw23.cube.l	FITS	9.6 kB	17:55
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw23.cube.l	FITS	1.4 MB	17:55
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw23.cube.l	FITS	6.3 MB	17:55
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw23.cube.l	FITS	2.9 MB	17:55
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw25.cube.l	FITS	790.5 MB	17:55
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw25.cube.l	FITS	3.0 GB	17:56
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw25.mfs.l.r	FITS	9.7 kB	17:56
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw25.mfs.l.f	FITS	1.7 MB	17:56
member.uid__A001_X158f_X7a1_P1113921.7_sci.spw25.mfs.l.f	FITS	6.3 MB	17:56
member.uid__A001_X158f_X7a1_J1058p0133_bp.spw17.mfs.l.m	FITS	2.2 kB	17:54
member.uid__A001_X158f_X7a1_J1058p0133_bp.spw17.mfs.l.pt	FITS	106.5 kB	17:54
member.uid__A001_X158f_X7a1_J1058p0133_bp.spw17.mfs.l.pt	FITS	371.5 kB	17:54

File Information:

- Name = member.uid\_\_A001\_X158f\_X7a1\_P1113921.7\_sci.spw25.cube.l.pbcor
- HDU = 0
- Data type = float
- Shape = [1250, 1250, 477, 1]
- Number of channels = 477
- Number of polarizations = 1
- Coordinate type = Right Ascension, Declination
- Projection = SIN
- Image reference pixels = [626, 626]
- Image reference coords = [11:39:21.7420, +020.24.50.9000]
- Image ref coords (deg) = [174.841 deg, 20.4141 deg]
- Pixel increment = -0.09", 0.09"
- Pixel unit = Jy/beam
- Celestial frame = ICRS
- Spectral frame = LSRK
- Velocity definition = RADIO
- Restoring beam = 0.906603" X 0.608119", -33.8059 deg
- RA range = [11:39:17.747, 11:39:25.744]
- DEC range = [+20.23.54.647, +20.25.47.057]

More than one image can be loaded into CARTA by clicking on File and then Append Image and then selecting a file in the File Browser.



Images can be displayed either individually or in a grid by clicking on an icon above the image panel.

The screenshot displays the CARTA software interface. At the top, a browser window shows the URL `172.21.80.169:3002/?token=6744a761-41ac-4614-a9da-c5b6c6dbc678`. Below the browser is a menu bar (File, View, Widgets, Help) and a toolbar with various icons. A yellow arrow points to a grid view icon in the toolbar.

The main display area contains two circular radio astronomy images side-by-side. The left image has a color scale from -0.0013 to 0.0011. The right image has a color scale from -0.005 to 0.005. Both images show a bright central source. The axes are labeled 'Right ascension' and 'Declination'.

Below the images is a 'Render Configuration' panel with a histogram and various settings:

- 90% 95% 99% 99.5% 99.9% 99.95% 99.99% 100% Custom
- Histogram: Per-Channel
- Clip Min: -0.00533447583
- Clip Max: 0.005261990571
- Scaling: Linear
- Color map: [Color bar]
- Invert color map: [Off]

On the right side, there are two profile panels:

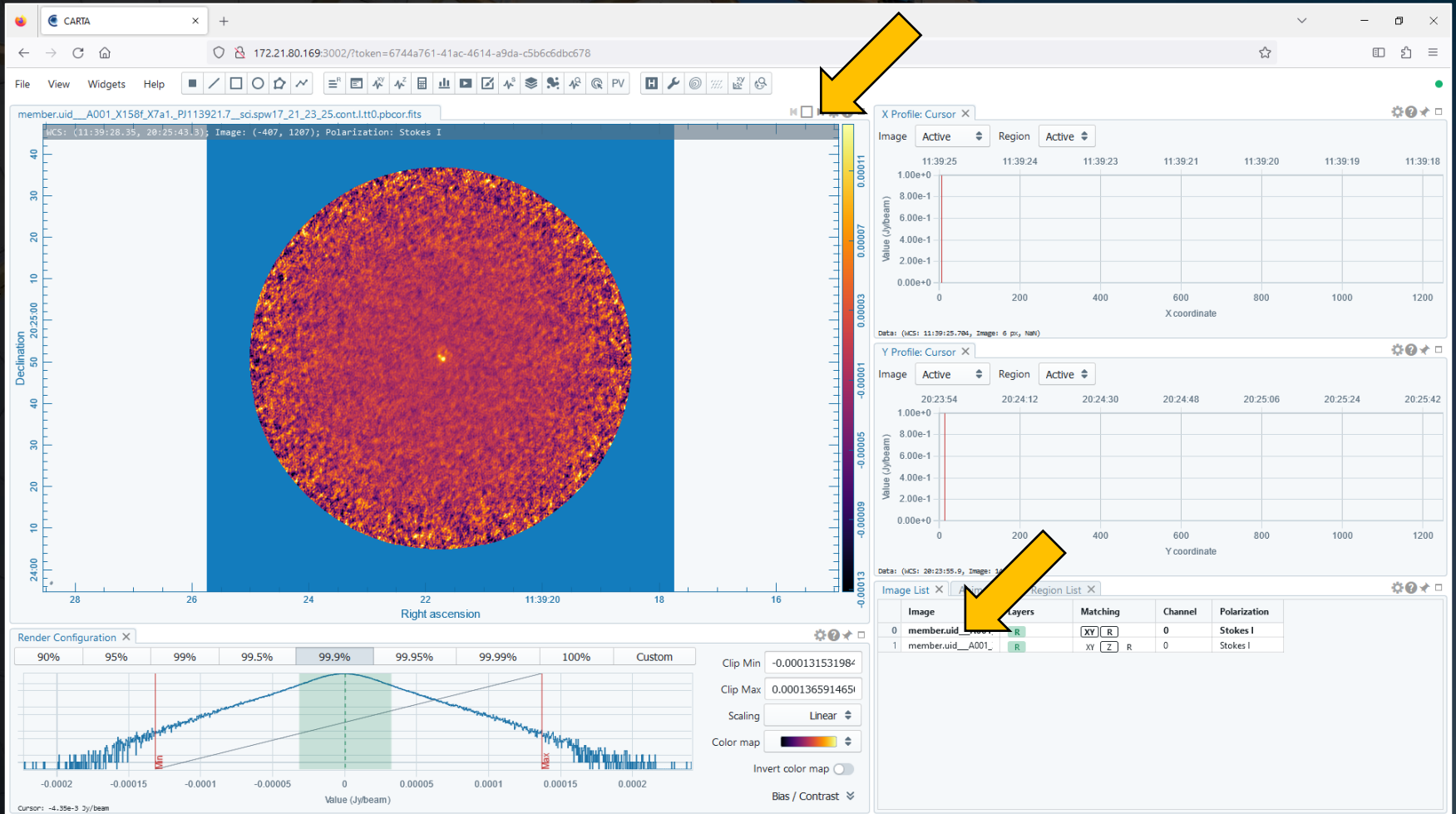
- X Profile: Cursor X**: Image Active, Region Active. Y-axis: Value (0.00e+0 to 1.00e+0). X-axis: X coordinate (0 to 1).
- Y Profile: Cursor X**: Image Active, Region Active. Y-axis: Value (0.00e+0 to 1.00e+0). X-axis: Y coordinate (0 to 1).

At the bottom right is an 'Image List' table:

Image	Layers	Matching	Channel	Polarization
0 member.uid__A001_	R	XY R	0	Stokes I
1 member.uid__A001_	R	XY Z R	0	Stokes I



When images are displayed individually, it is possible to switch between images by clicking on the arrows above the image, by clicking on the name of an image in the Image List, or by paging between images in the Animator widget.







The Animator widget can also be used to move between channels in an image cube and change the Stokes parameter displayed in images from full polarization observations.

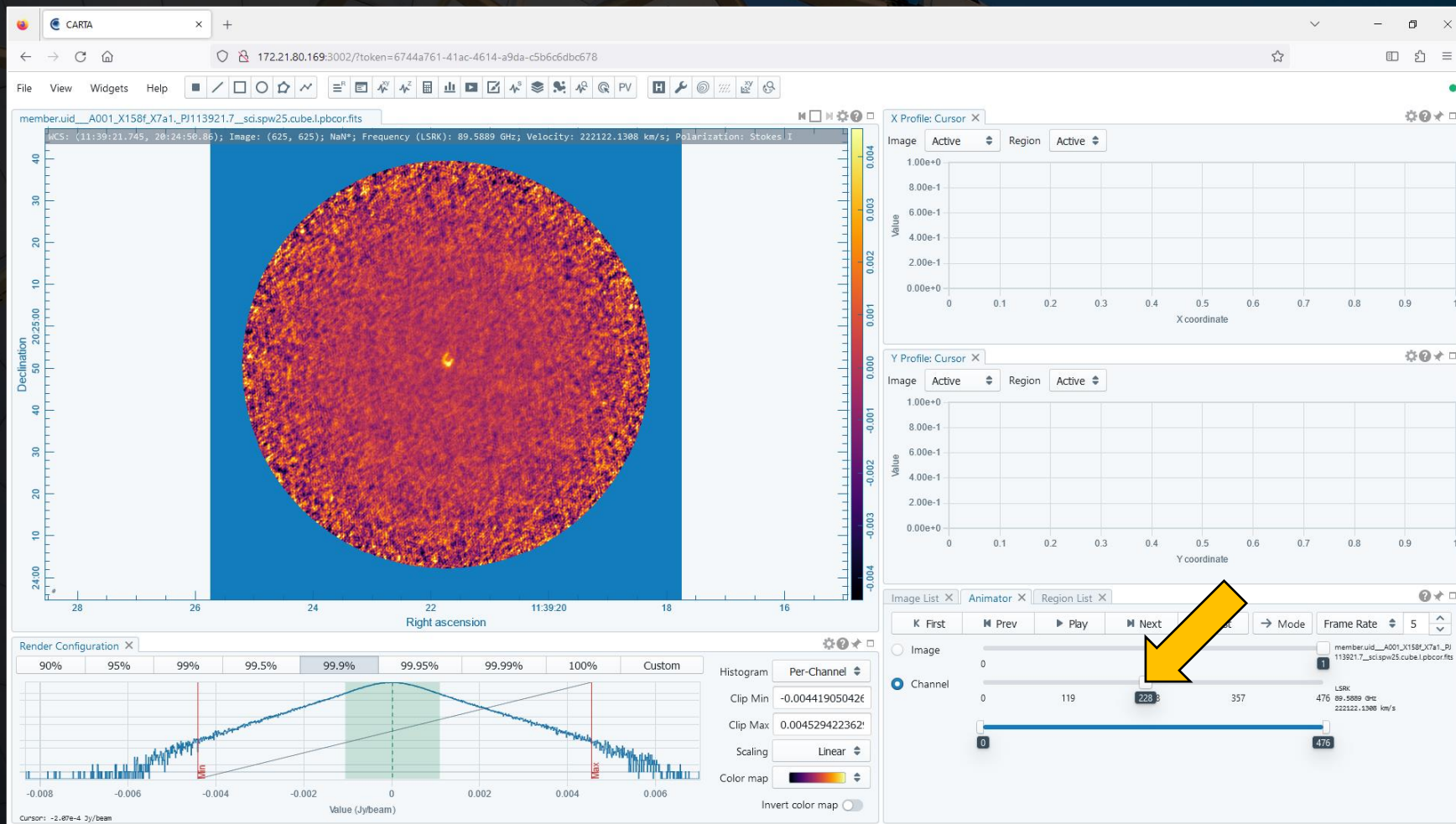


Image coordinate systems can be aligned by clicking on the XY option in the Matching column in the Image List widget.

The screenshot displays the CARTA software interface. The main window shows a circular radio astronomy image with a color scale on the right ranging from -0.005 to 0.005. The axes are labeled 'Right ascension' and 'Declination'. Below the image is a 'Render Configuration' panel with a histogram and various settings like 'Clip Min', 'Clip Max', and 'Scaling'. On the right side, there are two profile plots: 'X Profile: Cursor X' and 'Y Profile: Cursor X', both showing 'Value' vs 'Coordinate'. At the bottom right, the 'Image List' widget is visible, containing a table with columns for 'Image', 'Layers', 'Matching', 'Channel', and 'Polarization'. A yellow arrow points to the 'XY' option in the 'Matching' column of the first row.

Image	Layers	Matching	Channel	Polarization
0 member.uid__A001_	R	XY	0	Stokes I
1 member.uid__A001_	R	XY	0	Stokes I



Image headers can be displayed by clicking on the icon with the H in the button bar.

The screenshot displays the CARTA software interface. A yellow arrow points to the 'H' icon in the toolbar, which is used to display the file header. The 'File Header' dialog box is open, showing the following information:

```
File Information Header
SIMPLE = T / Standard FITS
BITPIX = -32 / Floating point (32 bit)
NAXIS = 4
NAXIS1 = 1250
NAXIS2 = 1250
NAXIS3 = 477
NAXIS4 = 1
EXTEND = T
BSCALE = 1.000000000000E+00 / PHYSICAL = PIXEL*BSCALE + BZERO
BZERO = 0.000000000000E+00
BMAJ = 2.518340625389E-04
BMIN = 1.689219347791E-04
BPA = -3.389586726234E+01
BTYPE = Intensity
OBJECT = PJ113921.7
BUNIT = Jy/beam / Brightness (pixel) unit
RADESYS = ICRS
LONPOLE = 1.800000000000E+02
LATPOLE = 2.041413888889E+01
PC1_1 = 1.000000000000E+00
PC2_1 = 0.000000000000E+00
PC3_1 = 0.000000000000E+00
PC4_1 = 0.000000000000E+00
PC1_2 = 0.000000000000E+00
PC2_2 = 1.000000000000E+00
PC3_2 = 0.000000000000E+00
PC4_2 = 0.000000000000E+00
```

The main window shows a radio astronomy image with a color scale from -0.005 to 0.005. The X and Y coordinates are displayed as 400, 600, 800, 1000, and 1200. The Region List table is also visible:

Matching	Channel	Polarization
XY R	0	Stokes I
XY Z R	0	Stokes I



Clicking on the contour icon in the button bar will open a window that can be used to generate contours. This is good when overlaying one form of emission over another.

The screenshot displays the CARTA software interface. The main window shows a radio astronomy image of a circular field with a color scale from blue to red. A 'Contour Configuration' dialog box is open in the center, allowing users to generate contours. The dialog includes a histogram of the data values, a 'Generate' button, and various parameters such as 'Start', 'Step', 'N', and 'Multiplier'. A yellow arrow points to the contour icon in the toolbar. The background shows a large radio telescope dish.

**Contour Configuration**

Data: member.uid\_\_A001\_X158f\_X7a1\_PJ113921.7\_\_sci.spw17\_21\_23\_25.cont.Ltt0.pbcor.fits  
Source: [locked]

Levels Configuration Styling

Generator: start-step-multiplier **Generate**

Parameters: Start: 1.599e-4 Step: 1.279e-4  
N: 5 Multiplier: 1

Levels: [empty]

Clear Apply Close

Scaling: Linear  
Color map: [color bar]  
Invert color map: [off]  
Bias / Contrast: [dropdown]

Layers	Matching	Channel	Polarization			
4__A001	R	XY	R	0	Stokes I	
2__A001	R	XY	Z	R	0	Stokes I

Clicking on the contour icon in the button bar will open a window that can be used to generate contours. This is good when overlaying one form of emission over another.

The screenshot displays the CARTA software interface. The main window shows a radio astronomy image of a circular source with a color scale from blue to red. A 'Contour Configuration' dialog box is open in the center, featuring a histogram of the image data. A yellow arrow points to the 'Generate' button in the dialog. The dialog includes the following fields and controls:

- Data:** member.uid\_\_A001\_X158f\_X7a1\_PJ113921.7\_\_sci.spw17\_21\_23\_25.cont.Ltt0.pbcor.fits
- Source:** [locked icon]
- Levels:** Configuration Styling
- Generator:** start-step-multiplier **Generate**
- Parameters:** Start: 5.000e-5 Step: 5.000e-5 N: 5 Multiplier: 1
- Levels:** 5.00e-5 × 1.00e-4 × 1.50e-4 × 2.00e-4 × 2.50e-4 ×
- Buttons:** Clear Apply Close
- Scaling:** Linear
- Color map:** [color bar]
- Invert color map:** [checkbox]
- Bias / Contrast:** [dropdown]

The background interface includes a 'Render Configuration' window at the bottom left with a histogram and a 'Region List' table at the bottom right.

Layers	Matching	Channel	Polarization
d__A001	R	XY   R	0 Stokes I
f__A001	R	XY   Z R	0 Stokes I

Clicking on the contour icon in the button bar will open a window that can be used to generate contours. This is good when overlaying one form of emission over another.

The screenshot shows the CARTA software interface. The main window displays a radio astronomy image with a circular field of view. The axes are labeled 'Right ascension' and 'Declination'. A 'Contour Configuration' dialog box is open in the center, showing a histogram of the data values. The dialog box has a 'Generate' button highlighted with a yellow arrow. The dialog box also shows the 'Levels' section with a list of values: 5.00e-5, 1.00e-4, 1.50e-4, 2.00e-4, 2.50e-4. The 'Parameters' section shows 'Start' as 5.000e-5, 'Step' as 5.000e-5, 'N' as 5, and 'Multiplier' as 1. The 'Levels' section has a 'Clear' button and an 'Apply' button. The 'Apply' button is highlighted with a yellow arrow.

Render Configuration X

90%	95%	99%	99.5%	99.9%	99.95%	99.9%

Cursor: -1.68e-4 Jy/beam

Layers	Matching	Channel	Polarization
d_A001	XY   R	0	Stokes I
d_A001	XY   Z R	0	Stokes I

Clicking on the contour icon in the button bar will open a window that can be used to generate contours. This is good when overlaying one form of emission over another.

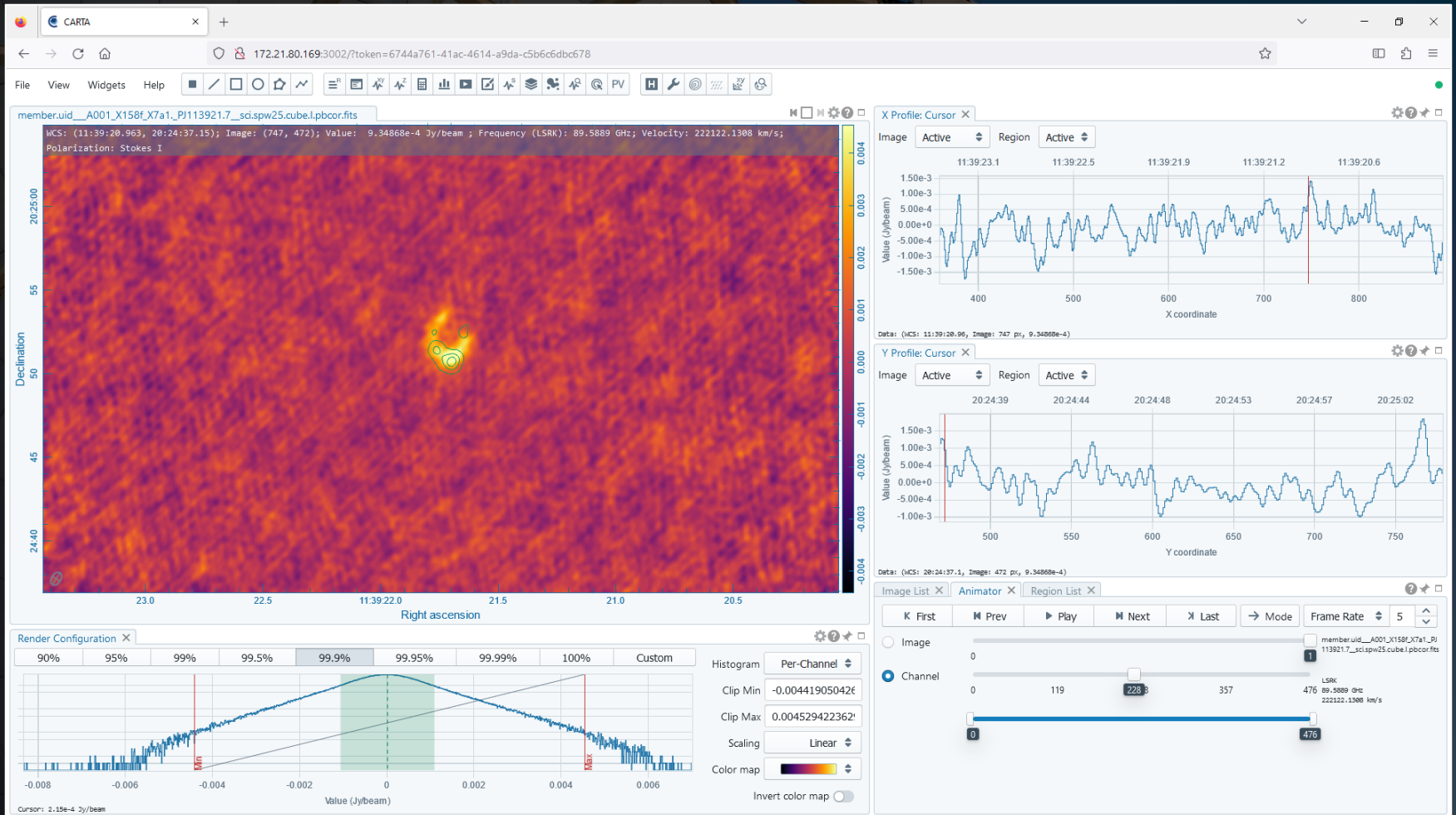
The screenshot displays the CARTA software interface. The main window shows a circular image of a radio galaxy with a color scale on the right ranging from -0.00013 to 0.00011. The axes are labeled 'Right ascension' and 'Declination'. Below the main image is a histogram showing the distribution of values, with a 'Render Configuration' window open over it. The histogram shows a peak at 0, with 'Min' and 'Max' markers. The 'Render Configuration' window includes a 'Clip Min' of -0.000131531984 and a 'Clip Max' of 0.0001365914651. The 'Scaling' is set to 'Linear' and the 'Color map' is a rainbow spectrum. The 'Bias / Contrast' is also visible.

On the right side, there are two profile windows: 'X Profile: Cursor X' and 'Y Profile: Cursor X'. Both show a plot of 'Value (Jy/beam)' versus 'X coordinate' or 'Y coordinate'. The 'X Profile' shows a sharp peak at approximately X=1200. The 'Y Profile' shows a sharp peak at approximately Y=0. Below these are 'Image List' and 'Region List' windows. The 'Image List' window contains the following table:

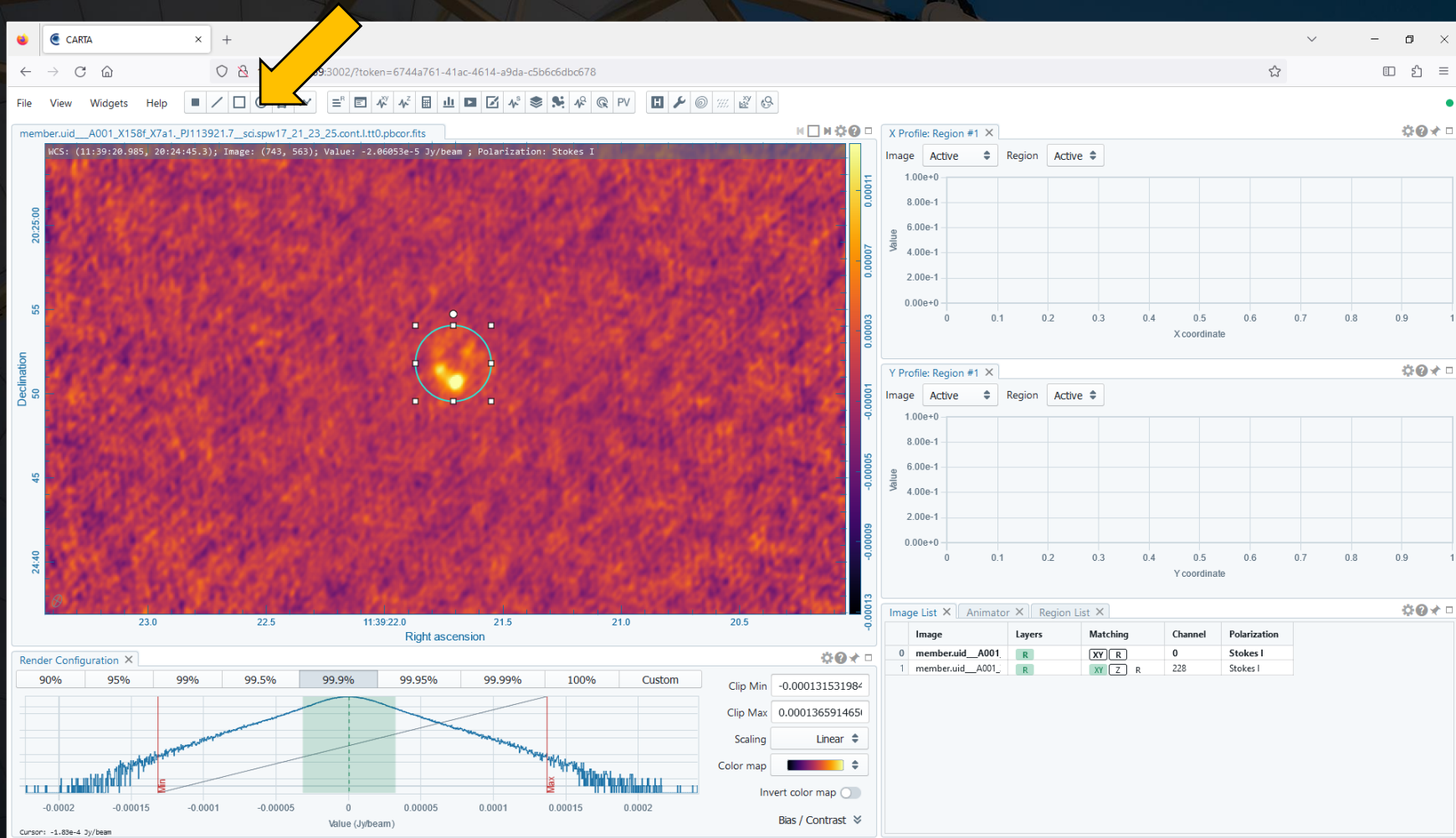
Image	Layers	Matching	Channel	Polarization
0 member.uid__A001	R C	XY R	0	Stokes I
1 member.uid__A001	R	XY Z R	0	Stokes I



Clicking on the contour icon in the button bar will open a window that can be used to generate contours. This is good when overlaying one form of emission over another.



Regions can be drawn on the image by clicking on one of the shapes in the menu bar and then drawing that shape in the image panel. These regions can be used by several other widgets.



Double clicking on a region in an image or in the Region List widget will display information about that region.

The screenshot displays the CARTA software interface. The main window shows a radio astronomy image with a color scale from -0.00013 to 0.00011. A yellow circle highlights a region of interest, with a yellow arrow pointing to it. The Region List widget at the bottom right shows a table with the following data:

Name	Type	Center	Size	P.A. (deg)
Cursor	Point	11:39:20.985 20:24:45.3		0.0
Region 1	Ellipse	11:39:21.7099796862 20:24:51.8005009413	2.2500000000" 2.2500000000"	0.0

The histogram at the bottom left shows the distribution of values, with a green shaded region indicating the current region's range. The histogram is labeled 'Value (Jy/beam)' and has a cursor at 1.67e-4 Jy/beam. The Region List widget also has a yellow arrow pointing to the 'Region 1' entry.



Double clicking on a region in an image or in the Region List widget will display information about that region.

The screenshot displays the CARTA software interface. The main window shows a radio telescope image with a color scale on the right ranging from 0.00007 to 0.00011. A dialog box titled "Editing Region 1" is open, showing the following details:

- Appearance:** Color (red), Line Width (px) 2, Dash Length (px) 0.
- Properties:** Region Name (Enter a region name), Coordinate (World), Center (11:39:21.70997, 20:24:51.80050), Semi-axes (2.2500000000", 2.2500000000"), P.A. (deg) 0.

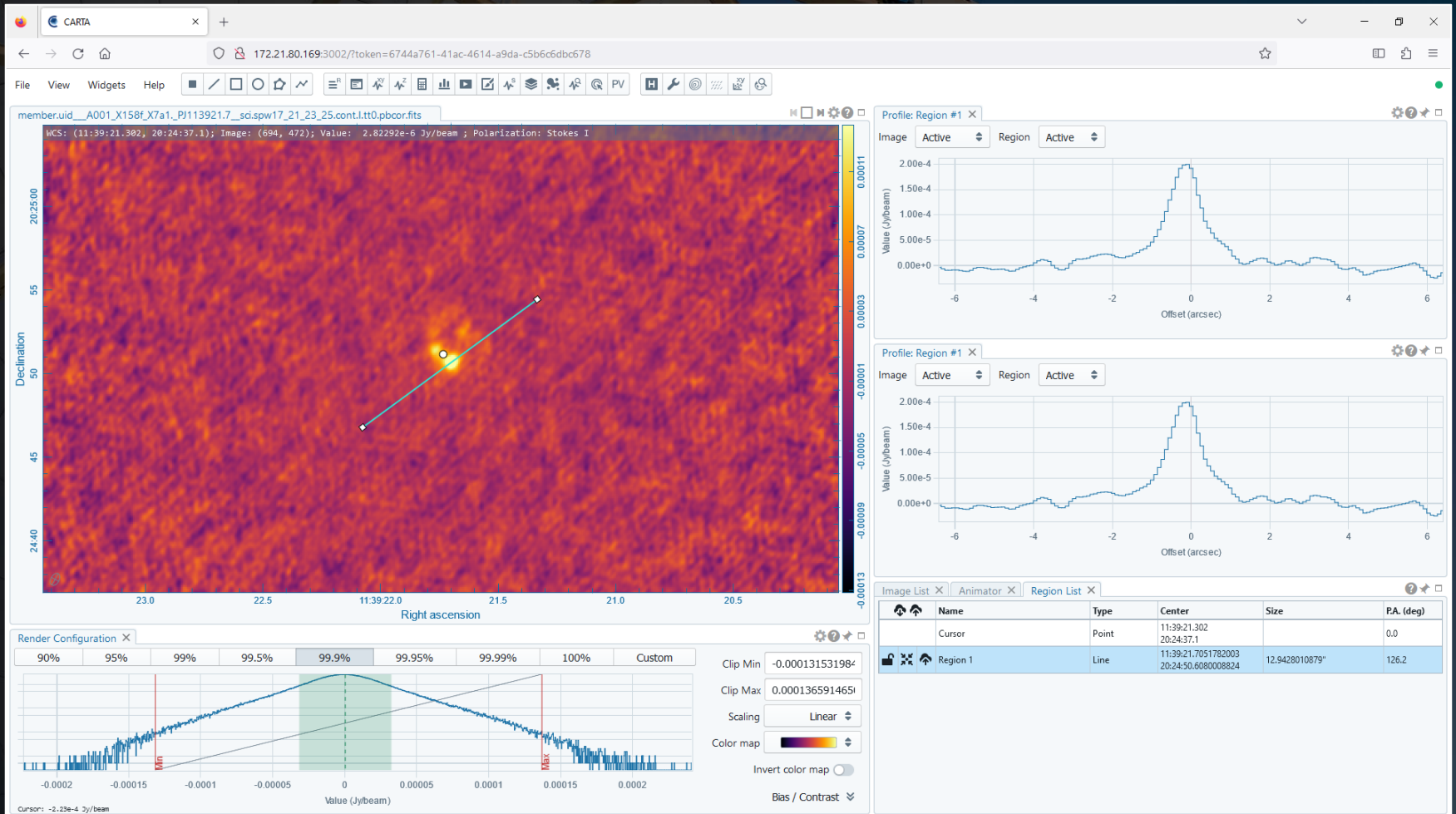
Below the image is a "Render Configuration" panel with a histogram of the image data. The histogram shows a distribution of values from -0.0002 to 0.0002, with a peak at 0. The "Clip Min" is set to -0.000131531984 and "Clip Max" is 0.0001365914651. The "Color map" is set to "Linear".

At the bottom right, the "Region List" widget displays a table of regions:

	Type	Center	Size	P.A. (deg)
Cursor	Point	11:39:20.985 20:24:45.3		0.0
Region 1	Ellipse	11:39:21.7099796862 20:24:51.8005009413	2.2500000000" 2.2500000000"	0.0



X Profile and Y Profile windows will, by default, show the x and y profiles at the position of the cursor. If a line region is drawn on the image, these widgets can be used to show the x and y profiles of the line.



The Statistics widget will display statistical information either for the pixels within an individual region (such as a circle) or for the entire image.

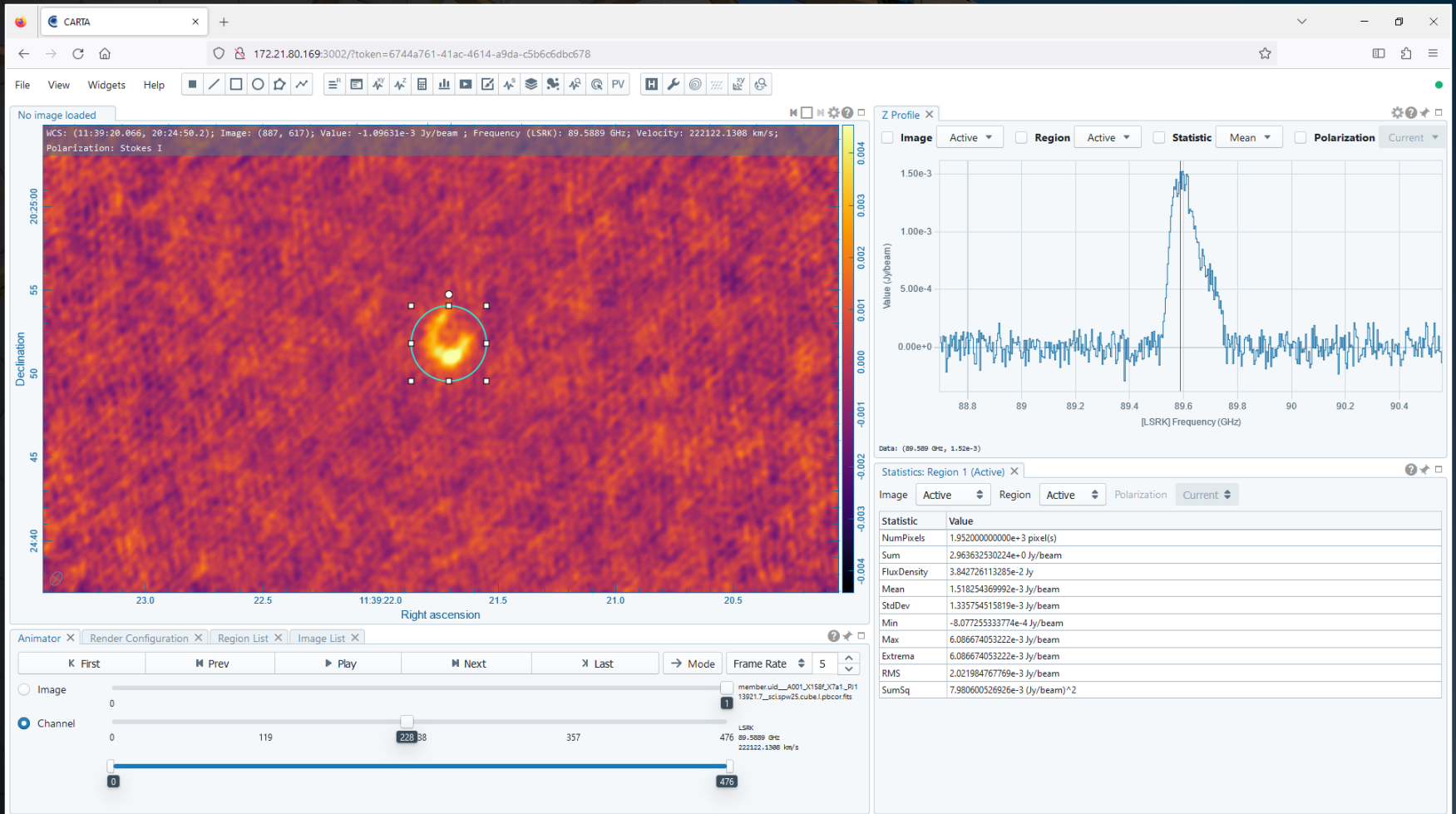
The screenshot displays the CARTA software interface. A yellow arrow points to the 'Statistics' widget in the top toolbar. The main window shows a radio astronomy image with a color scale from -0.00013 to 0.00011. A region of interest (Region 1) is defined by a red ellipse. The 'Statistics: Region 1 (Active)' window is open, showing the following data:

Statistic	Value
NumPixels	1.961000000000e+3 pixel(s)
Sum	7.068734640706e-2 Jy/beam
FluxDensity	1.286420301871e-3 Jy
Mean	3.604658154363e-5 Jy/beam
StdDev	3.473249264475e-5 Jy/beam
Min	-2.632030373206e-5 Jy/beam
Max	2.10575702360e-4 Jy/beam
Extrema	2.10575702360e-4 Jy/beam
RMS	5.005084332441e-5 Jy/beam
SumSq	4.912475445187e-6 (Jy/beam) <sup>2</sup>

The 'Render Configuration' window at the bottom left shows a histogram of the image values, with a green shaded region indicating the current clip range from -0.00013 to 0.00011. The 'Image List' window at the bottom right shows the following table:

Name	Type	Center	Size	P.A. (deg)
Cursor	Point	11:39:22.105 20:24:54.34		0.0
Region 1	Ellipse	11:39:21.7099796862 20:24:51.8005009413	2.2500000000" 2.2500000000"	0.0

The Z Profile will show the spectrum measured within an image cube at the position of the cursor or within a region. (Because spectra can be slow to load and because the spectrum updates when the cursor is moved across an image, displaying the spectrum within a region works better.)





Left clicking on a specific location in the spectrum will display the image cube at that specific frequency.

HCs: (11:39:20.162, 20:24:58.2); Image: (872, 706); Value: 3.82817e-4 Jy/beam; Frequency (LSRK): 89.6944 GHz; Velocity: 222030.7014 km/s; Polarization: Stokes I

Right ascension: 23.0, 22.5, 11:39:22.0, 21.5, 21.0, 20.5

Declination: 24.40, 45, 55, 20:25:00

Z Profile X

Value (Jy/beam): 1.50e-3, 1.00e-3, 5.00e-4, 0.00e+0

LSRKJ Frequency (GHz): 88.8, 89, 89.2, 89.4, 89.6, 89.8, 90, 90.2, 90.4

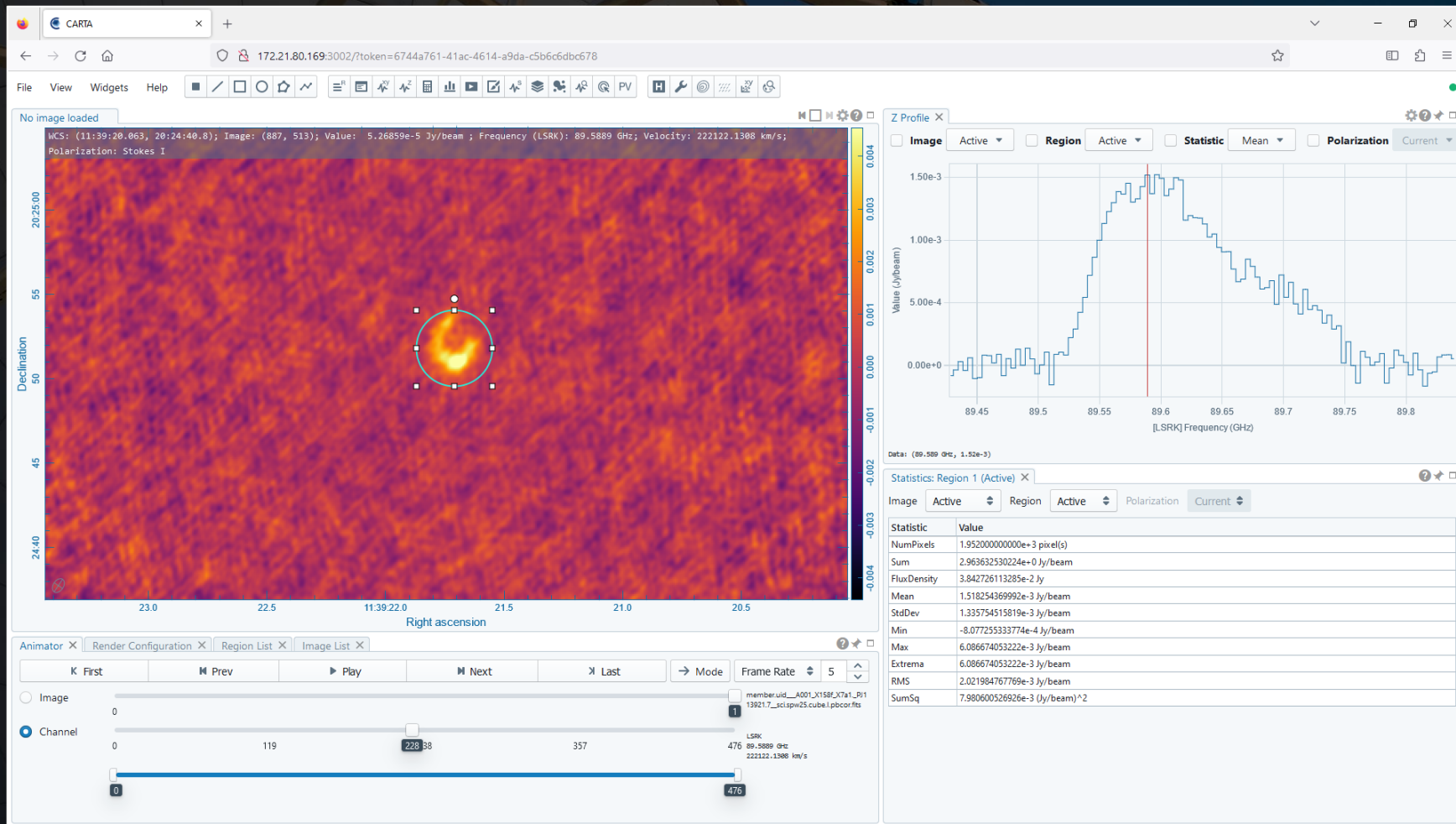
Data: (89.694 GHz, 4.856e-4)

Statistics: Region 1 (Active) X

Statistic	Value
NumPixels	1.952000000000e+3 pixel(s)
Sum	9.533261039725e-1 Jy/beam
FluxDensity	1.236108416564e-2 Jy
Mean	4.883842745761e-4 Jy/beam
StdDev	8.028643198581e-4 Jy/beam
Min	-9.380040573888e-4 Jy/beam
Max	3.970680758357e-3 Jy/beam
Extrema	3.970680758357e-3 Jy/beam
RMS	9.395637790463e-4 Jy/beam
SumSq	1.723186745237e-3 (Jy/beam)^2



Holding down the left mouse button and dragging within the plot of the spectrum will zoom in on that location. (Double-clicking will zoom out again.)



The smoothing option in the Z Profile window (accessible through settings if the button is not visible) provides options for smoothing the spectrum.

The screenshot displays the CARTA software interface. The main window shows a spectral image with a color scale from -0.003 to 0.003. The Z Profile window is open, showing a plot of Value (J/beam) versus [LSRK] Frequency (GHz). The plot shows a peak at approximately 89.6 GHz. The Z Profile window has tabs for Image, Region, and Statistic. The Statistic tab is active, showing a table of statistics for Region 1 (Active).

**Z Profile Settings: Region #1 (Active)**

- Conversion: [None]
- Styling: [None]
- Smoothing: [None]
- Moments: [None]
- Fitting: [None]

Method: Boxcar

Color: [Red]

Line Style: [None]

Line Width (px): 1

Point Size (px): 1

Overlay: [Off]

Kernel: 8

**Z Profile X**

Image: Active | Region: Active | Statistic: Mean | Polarization: Current

Value (J/beam) vs [LSRK] Frequency (GHz)

Data: (89.702 GHz, 5.45e-4)

**Statistics: Region 1 (Active) X**

Statistic	Value
NumPixels	1.952000000000e+3 pixel(s)
Sum	1.063091441329e+0 Jy/beam
FluxDensity	1.378433122441e-2 Jy
Mean	5.446165170741e-4 Jy/beam
StdDev	8.443887216754e-4 Jy/beam
Min	-9.777159430087e-4 Jy/beam
Max	4.016421269625e-3 Jy/beam
Extrema	4.016421269625e-3 Jy/beam
RMS	1.004606490874e-3 Jy/beam
SumSq	1.970025161342e-3 (Jy/beam) <sup>2</sup>

Animator: [None] | Render Configuration: [None] | Region List: [None] | Image List: [None]

Channel: 0 to 476 (LSRK: 89.702 GHz, 222023.9288 km/s)

The moment option in the Z Profile window (accessible through settings if the button is not visible) provides an option for creating moment images. These will appear as separate images in the Image List, and it is possible to switch to and from these moment images using the Animator.

The screenshot displays the CARTA software interface. The main window shows a spectral cube with a color scale from -0.003 to 0.003. The Z Profile window is open, showing the 'Moments' tab. A yellow arrow points to the 'Moments' button in the 'Z Profile Settings: Region #1 (Active)' window. Another yellow arrow points to the 'Generate' button at the bottom of the Z Profile window. The Animator window at the bottom shows the 'Channel' selected, with a slider ranging from 0 to 476. The Z Profile window also shows a plot of Value (J/beam) vs. [LSRK] Frequency (GHz) with a peak at approximately 89.7 GHz. The Statistics window for Region 1 (Active) is also visible, showing various statistical values.

**Z Profile Settings: Region #1 (Active)**

Conversion Styling Smoothing **Moments** Plotting

Image (1: membe...) Active

Region (Region 1) Active

Coordinate Frequency (GHz)

System LSRK

Range (GHz) From 89.5 To 89.75

Mask None

Range (Jy/beam) From 0 To 1

Moments 0 x

**Generate**

**Z Profile X**

Image Active Region Active Statistic Mean Polarization Current

Value (J/beam)

[LSRK] Frequency (GHz)

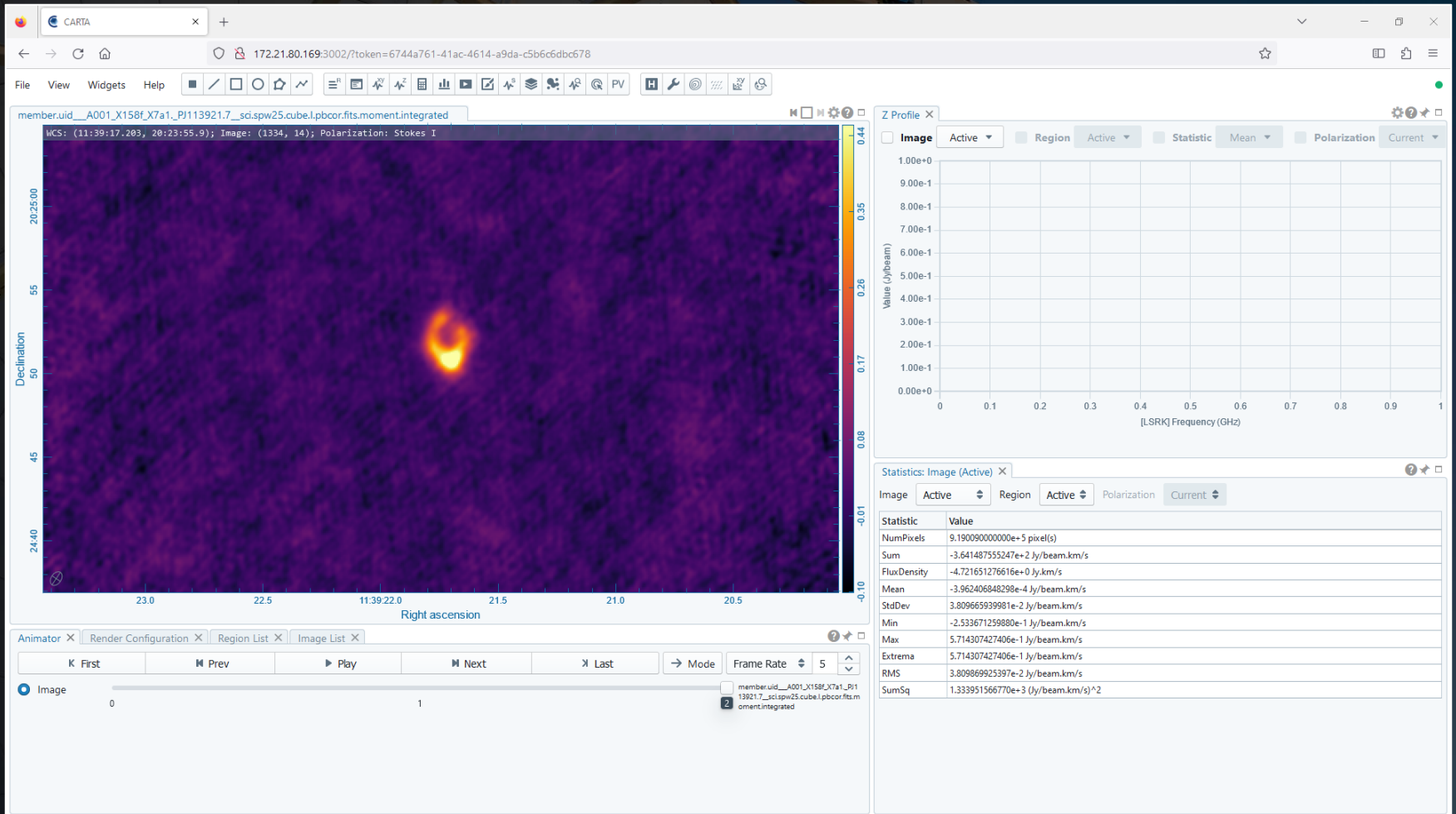
Data: (89.702 GHz, 5.456e-4)

**Statistics: Region 1 (Active) X**

Image Active Region Active Polarization Current

Statistic	Value
NumPixels	1.952000000000e+3 pixel(s)
Sum	1.063091441329e+0 Jy/beam
FluxDensity	1.378433122441e-2 Jy
Mean	5.446165170741e-4 Jy/beam
StdDev	8.443887216754e-4 Jy/beam
Min	-9.777159430087e-4 Jy/beam
Max	4.016421269625e-3 Jy/beam
Extrema	4.016421269625e-3 Jy/beam
RMS	1.004606490874e-3 Jy/beam
SumSq	1.970025161342e-3 (Jy/beam) <sup>2</sup>

The moment option in the Z Profile window (accessible through settings if the button is not visible) provides an option for creating moment images. These will appear as separate images in the Image List, and it is possible to switch to and from these moment images using the Animator.





The fitting option in the Z Profile window (accessible through settings if the button is not visible) can be used to fit a spectral line, although a priori values need to be set first (or estimated using the auto detect button).

The screenshot displays the CARTA software interface. The main window shows a spectral line plot with a Gaussian fit overlaid. The plot's x-axis is labeled 'LSRJQ Frequency (GHz)' and ranges from 88.8 to 90.4. The y-axis is labeled 'Value (J/beam)' and ranges from 0.00e+0 to 1.50e-3. A red vertical line marks the center of the fit at approximately 89.6 GHz. A yellow arrow points to the 'Fitting' tab in the 'Z Profile Settings: Region #1 (Active)' dialog box. Another yellow arrow points to the 'Fitting' button in the top right corner of the main window.

**Z Profile Settings: Region #1 (Active)**

- Conversion: [None]
- Styling: [None]
- Smoothing: [None]
- Moments: [None]
- Fitting**

Data source: memberuid\_\_A001\_X158f\_X7a1\_PJ113921.7\_sci.spw25.cube.lpbcor.fits

Profile function: Gaussian

Auto detect:  w/ cont.  auto fit

Components: 1

Center: 0

Amplitude: 0

FWHM: 0

Continuum: None

Fitting result: [Empty box]

**Z Profile X**

Image: Active | Region: Active | Statistic: Mean | Polarization: Current

Value (J/beam) vs. LSRJQ Frequency (GHz)

Data: (89.589 GHz, 1.52e-3)

**Statistics: Region 1 (Active) X**

Statistic	Value
NumPixels	1.952000000000e+3 pixel(s)
Sum	2.963632530224e+0 Jy/beam
FluxDensity	3.842726113285e-2 Jy
Mean	1.518254369992e-3 Jy/beam
StdDev	1.335754515819e-3 Jy/beam
Min	-8.077255333774e-4 Jy/beam
Max	6.086674053222e-3 Jy/beam
Extrema	6.086674053222e-3 Jy/beam
RMS	2.021984767769e-3 Jy/beam
SumSq	7.980600526926e-3 (Jy/beam)^2



The fitting option in the Z Profile window (accessible through settings if the button is not visible) can be used to fit a spectral line, although a priori values need to be set first (or estimated using the auto detect button).

The screenshot displays the CARTA software interface. The main window shows a spectral line plot with a green shaded region indicating a fit. A yellow arrow points to the 'Fit' button in the 'Z Profile Settings: Region #1 (Active)' dialog box. The dialog box contains the following information:

**Z Profile Settings: Region #1 (Active)**  
detected 1 component.

Components: 1

Center: 89.59479605729794

Amplitude: 0.001412333081501176

FWHM: 0.11717704799973205

Continuum: None

Fitting result: [Empty box]

Buttons: Reset, Fit, Log, residual

The main window also displays the following information:

member\_uid\_\_A001\_X158f\_X7a1\_PJ113921.7\_sq.spw25.cube.lpbcor.fits

HCS: (11:39:23.197, 20:24:39.1); Image: (398, 494); Value: 2.87048e-4 Jy/beam; Frequency (LSRK): 89.5889 GHz; Velocity: 222122.1388 km/s; Polarization: Stokes I

Declination: 20:25:00, 55, 50, 45, 24.40

21.0, 20.5

0.004, 0.003, 0.002, 0.001, 0.000, -0.001, -0.002, -0.003, -0.004

Z Profile X

Image Active, Region Active, Statistic Mean, Polarization Current

Value (Jy/beam)

1.50e-3, 1.00e-3, 5.00e-4, 0.00e+0

88.8, 89, 89.2, 89.4, 89.6, 89.8, 90, 90.2, 90.4

[LSRK] Frequency (GHz)

Data: (89.5889 GHz, 1.52e-5)

Statistics: Region 1 (Active) X

Image Active, Region Active, Polarization Current

Statistic	Value
NumPixels	1.952000000000e+3 pixel(s)
Sum	2.963632530224e+0 Jy/beam
FluxDensity	3.842726113285e-2 Jy
Mean	1.518254369992e-3 Jy/beam
StdDev	1.335754515819e-3 Jy/beam
Min	-8.077255333774e-4 Jy/beam
Max	6.086674053222e-3 Jy/beam
Extrema	6.086674053222e-3 Jy/beam
RMS	2.021984767769e-3 Jy/beam
SumSq	7.980600526926e-3 (Jy/beam)^2

Animator X, Render Configuration X, Region List X, Image List X

K First, Prev, Play, Next, Last, Mode, Frame Rate 5

Image, Channel

0, 119, 228, 357, 476

member\_uid\_\_A001\_X158f\_X7a1\_PJ113921.7\_sq.spw25.cube.lpbcor.fits

LSRK: 476 89.5889 GHz, 222122.1388 km/s

The fitting option in the Z Profile window (accessible through settings if the button is not visible) can be used to fit a spectral line, although a priori values need to be set first (or estimated using the auto detect button).

The screenshot displays the CARTA software interface. The main window shows a spectral plot with a blue line representing the data and an orange curve representing a fit. The x-axis is labeled "LSRK Frequency (GHz)" and ranges from 88.8 to 90.4. The y-axis is labeled "Value (J/beam)" and ranges from 0.00e+0 to 1.50e-3. A vertical red line is positioned at approximately 89.6 GHz. The plot is titled "Z Profile X" and has tabs for "Image", "Region", "Statistic", "Mean", and "Polarization".

A "Z Profile Settings: Region #1 (Active)" dialog box is open, showing the following parameters:

- Components: 1
- Center: 89.59479605729794
- Amplitude: 0.001412333081501176
- FWHM: 0.11717704799973205
- Continuum: None

The "Fitting result" section of the dialog box displays the following statistics:

- Component #1
- Center = 89.609853 (GHz)
- Center Error = 0.001268 (0.001%)
- Amplitude = 0.001419 (Jy/beam)
- Amplitude Error = 0.000027 (1.915%)
- FWHM = 0.135017 (GHz)
- FWHM Error = 0.002985 (2.211%)
- Integral = 0.000204 (Jy/beam \* GHz)
- Integral Error ~ 0.000004 (1.915%)

At the bottom of the dialog box, there are buttons for "Reset", "Fit", "View log", and a "residual" checkbox.

Below the dialog box, the "Statistics: Region 1 (Active) X" window is open, showing a table of statistics:

Statistic	Value
NumPixels	1.952000000000e+3 pixel(s)
Sum	2.963632530224e+0 Jy/beam
FluxDensity	3.842726113285e-2 Jy
Mean	1.518254369992e-3 Jy/beam
StdDev	1.335754515819e-3 Jy/beam
Min	-8.077255333774e-4 Jy/beam
Max	6.086674053222e-3 Jy/beam
Extrema	6.086674053222e-3 Jy/beam
RMS	2.021984767769e-3 Jy/beam
SumSq	7.980600526926e-3 (Jy/beam)^2

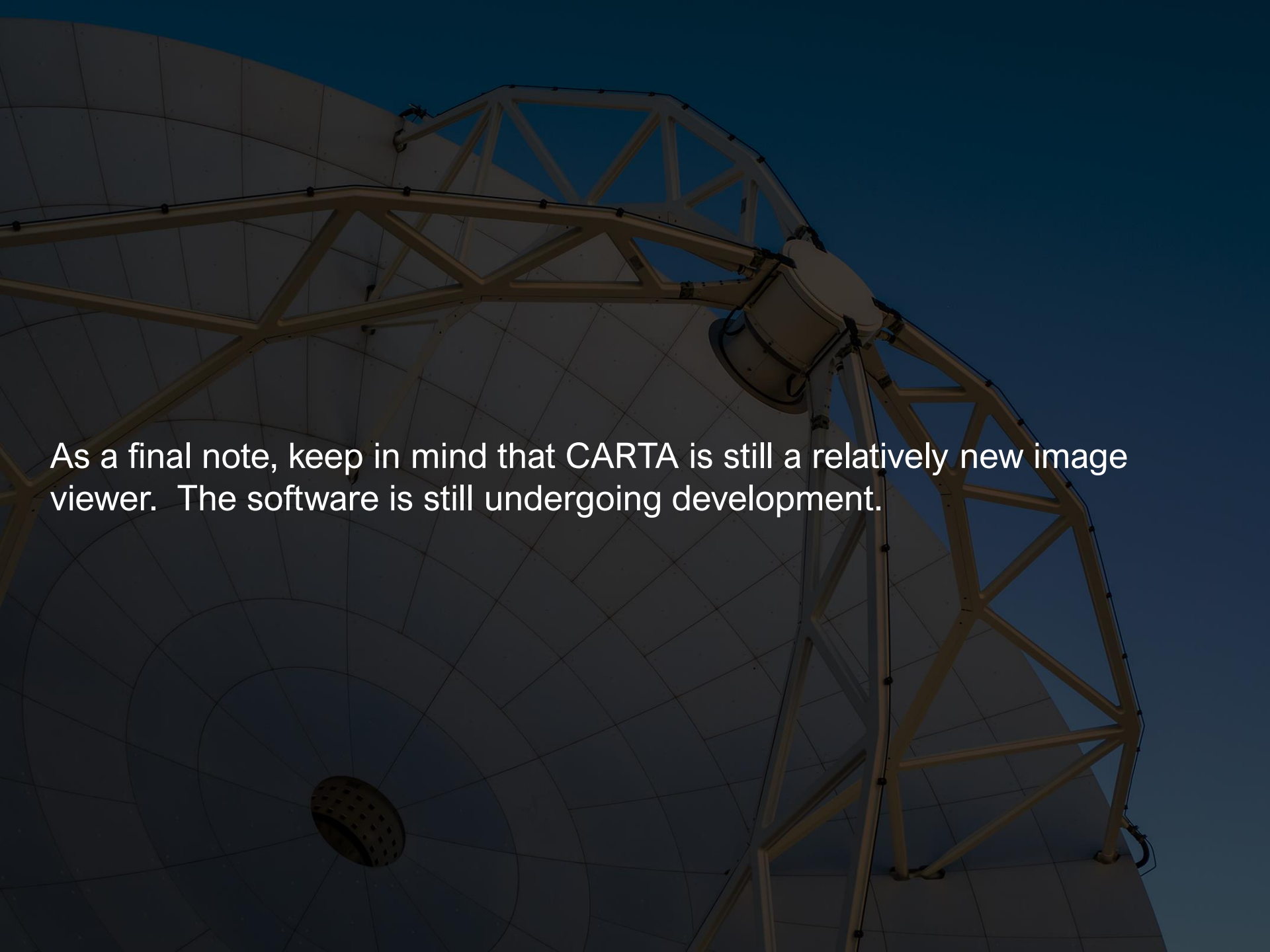
The bottom of the interface shows the "Animator" window with playback controls (First, Prev, Play, Next, Last) and a "Frame Rate" of 5. The "Image" and "Channel" sliders are visible, with the "Image" slider set to 0 and the "Channel" slider set to 228. The "LSRK" window shows the frequency range from 476 to 476 GHz.





CARTA also has other options, including the following:

- Display of data from user catalogues or from Simbar or VizieR
- Vector overlays
- Spectral line overlays (on spectra)
- Point source fitting
- Position-velocity plot generation
- Stokes analysis tools (including automatic creation of polarization fraction and angle images from Stokes image cubes)

A large satellite dish antenna structure is shown against a dark blue sky. The dish is composed of many white panels and is supported by a complex metal truss structure. A smaller, perforated dish is visible in the lower-left quadrant of the main dish's surface.

As a final note, keep in mind that CARTA is still a relatively new image viewer. The software is still undergoing development.