

# Results Cyrcé 23.09.2024

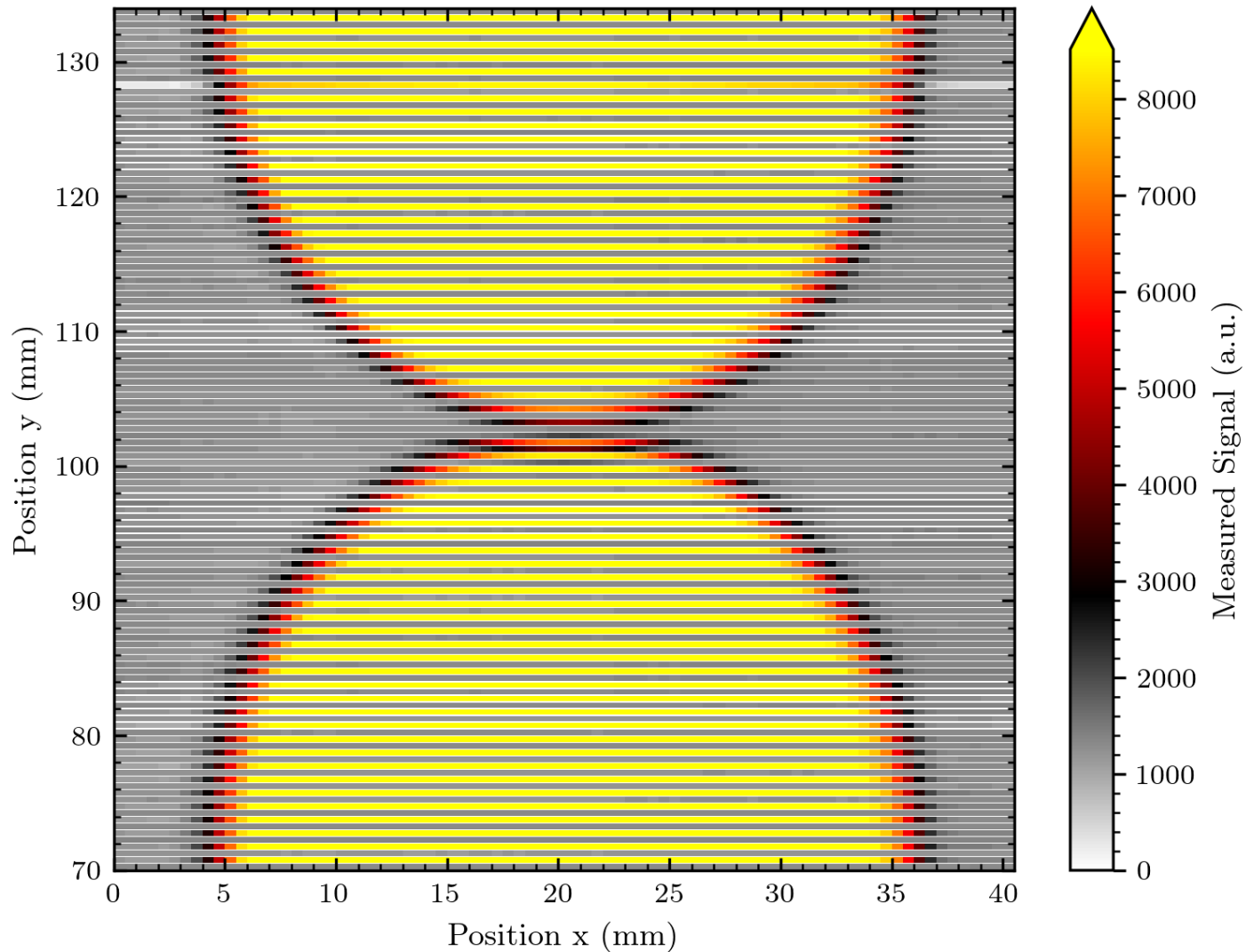
Measured arrays:

- 128 x 0.5 x 0.5 mm<sup>2</sup> array – ‘Array1’
- 128 x 0.25 x 0.5 mm<sup>2</sup> array - ‘Array3’

# Changes in readout process

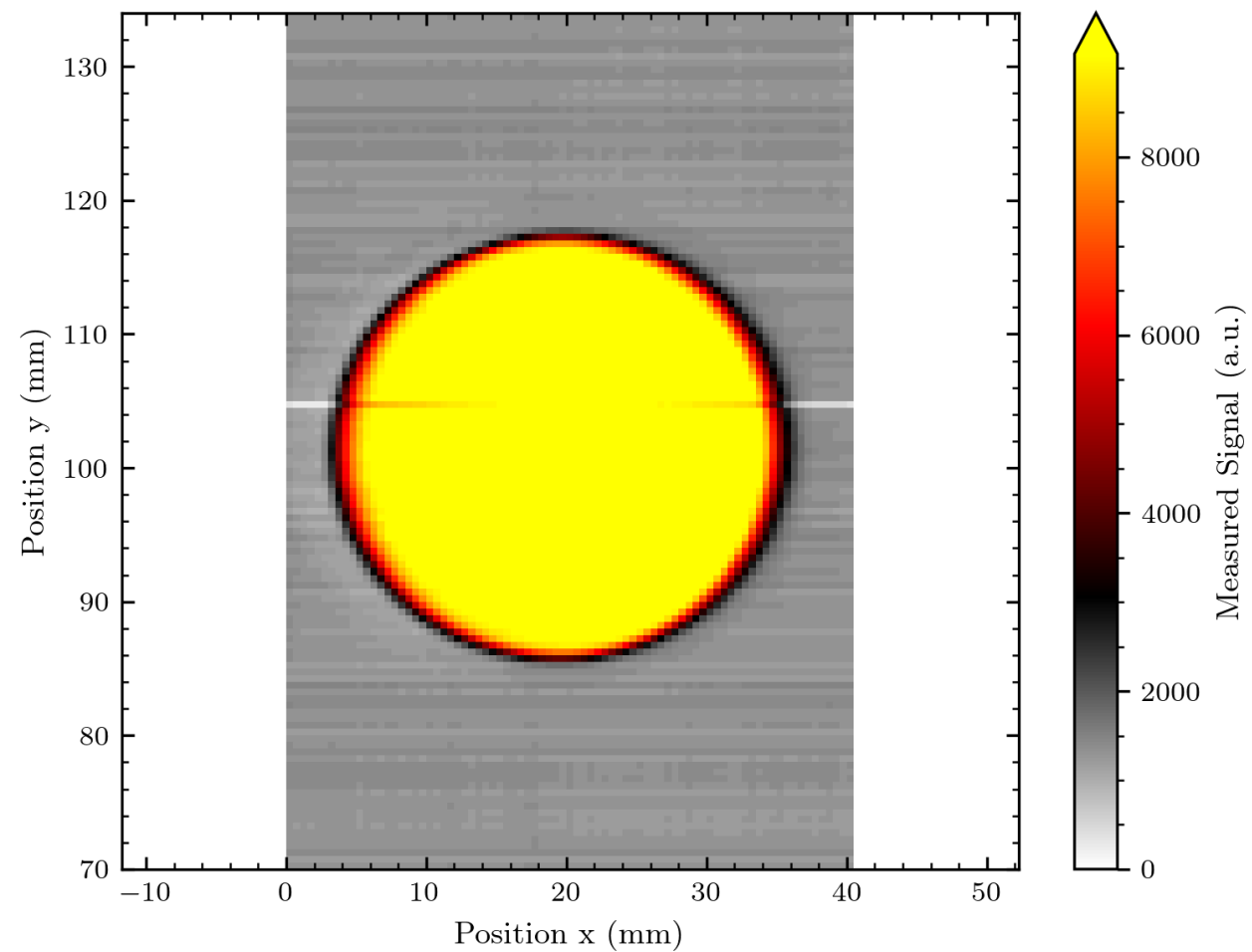
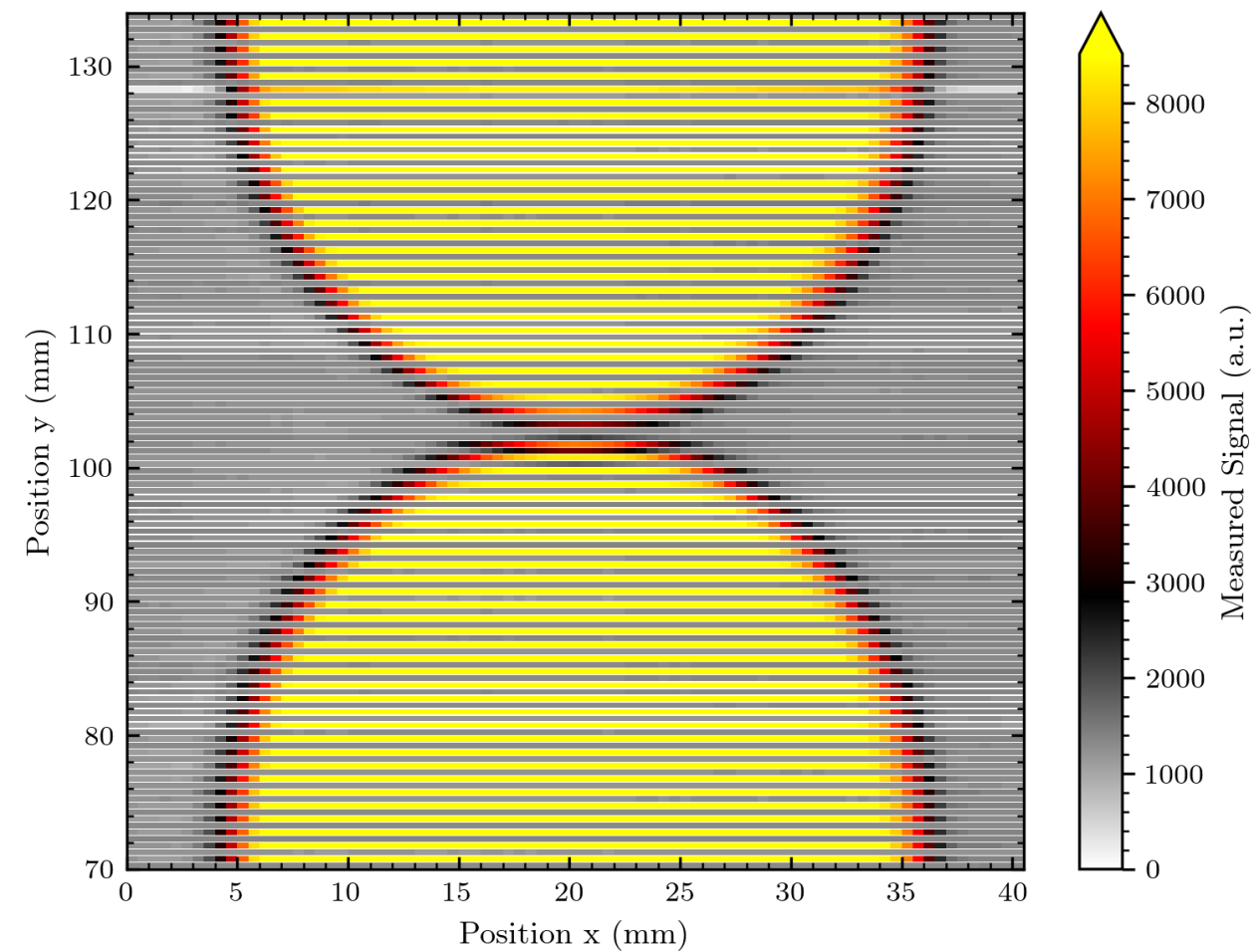
- New software version developed by me; easier to adapt to versatile situations (e.g. the new channel assignment change)
- Should also be ready for 2D arrays (eventually also translated 2D arrays, but in that case I might add some function)
- New in measurements: We have a not linear channel assignment (compare next slide)
  - The live results are harder to interpret, which means I will try to provide a LiveView for the next measurements that can be integrated into Stéphanes Tkinter measurement GUI

# What we see if we image the raw data



# Diode $i \neq$ Channel $i$

- There is an assignment from the bonding (seems to be the same for both arrays imaged)
- The assignment was provided in an Excel file by Stéphanes colleague
- I adapted the readout – we're now flexible to any assignment, as long as we get something like an Excel list



Correct assignment + Realistic Scaling



# Slight change in my imaging code

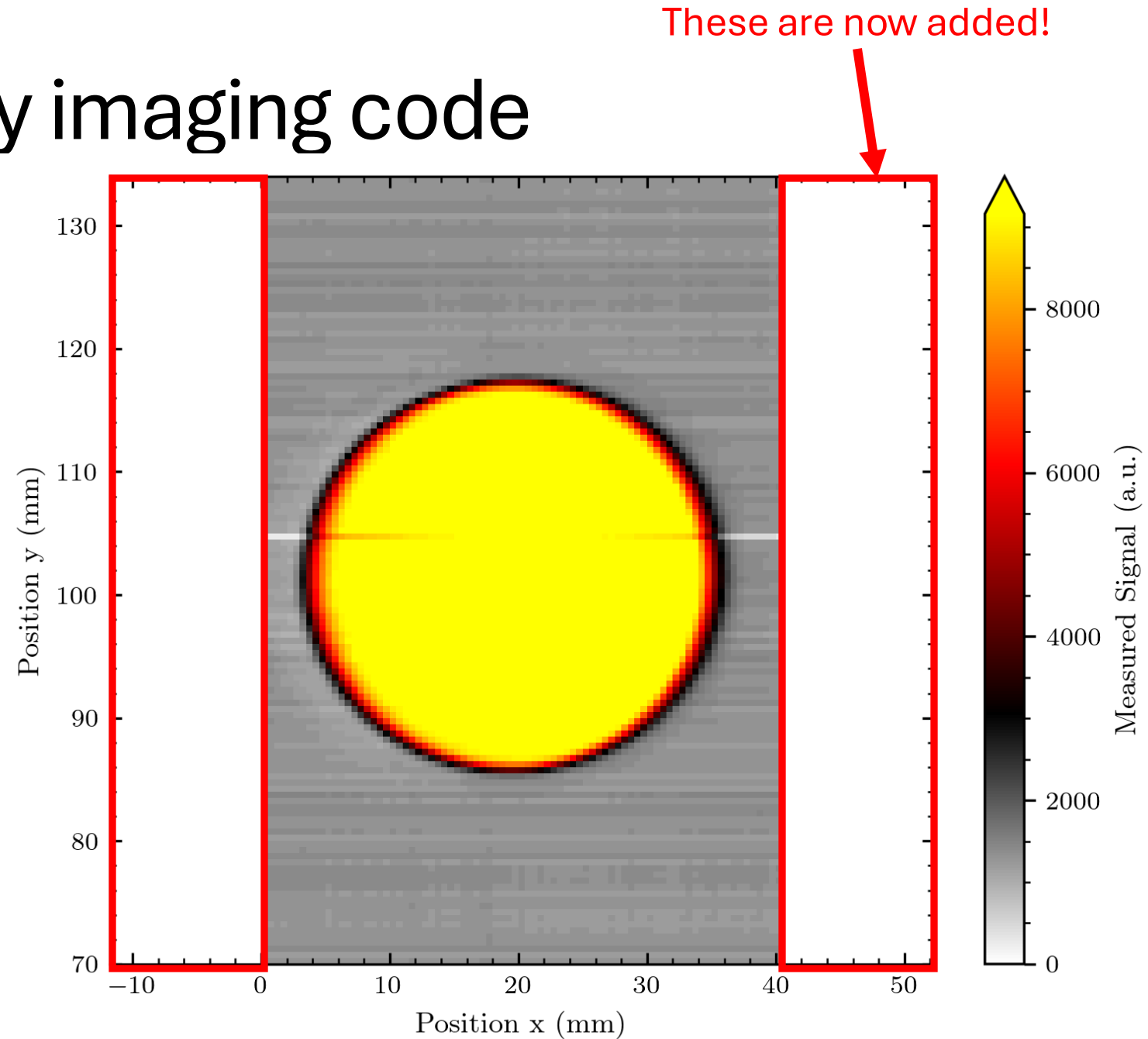
To concern you with some technical details of my plotting routine:

For the 128-diode array I faced an optical problem when plotting the data:  
The result is of course not a quadratic picture, thus the imaged shape is portrayed distorted

Thus, I now scale the axis on the same length (and currently the plot dimensions are height = Width / 1.3 – this compensates for the space of the width taken by the colorbar on the right)

This of course adds a white space in the plots, keep this in mind!

I haven't considered this so far as the older images from 64-diode arrays were nearly quadratic...



# What we measured

- Voltage tests (dark and with signal) for both arrays: From 0 to 2 V
- Y translated measurements over diffused beam: For normalization respectively check if the diode's response is homogenous
- Images of round aperture, logo, misc shape, Bragg shape and undiffused beam ('Array1') with 0.5 x translation steps at different regions of the array
- logo, undiffused beam ('Array3') with 0.25 x translation steps in one region of array

[The data now needs ~ double the data amount than before – meaning one map has ~ 150 MB or ~ 300 MB for the smaller steps]

# Measurement conditions

- Beam current for nearly everything: 2 nA on the array  
(With diffuser  $\sim 2.43$  nA at Faraday cup, without  $\sim 2$  nA)
- Bigger diffuser of 200  $\mu\text{m}$  (last times 40  $\mu\text{m}$ , where the beam was not flat)
  - We started with 400  $\mu\text{m}$  but the stray dose of diffused protons proved to be a problem for the labs above the beam room...
- There was an extra 25 mm collimator 1-2 m before the one that we were using – not a huge impact but good to have in mind
- In the morning (array 1: voltage check, images round aperture, logo, beam shape) the beam was stable; later it stabilized
  - I have noted the before after current of each measurement set and will later add this to the presentation



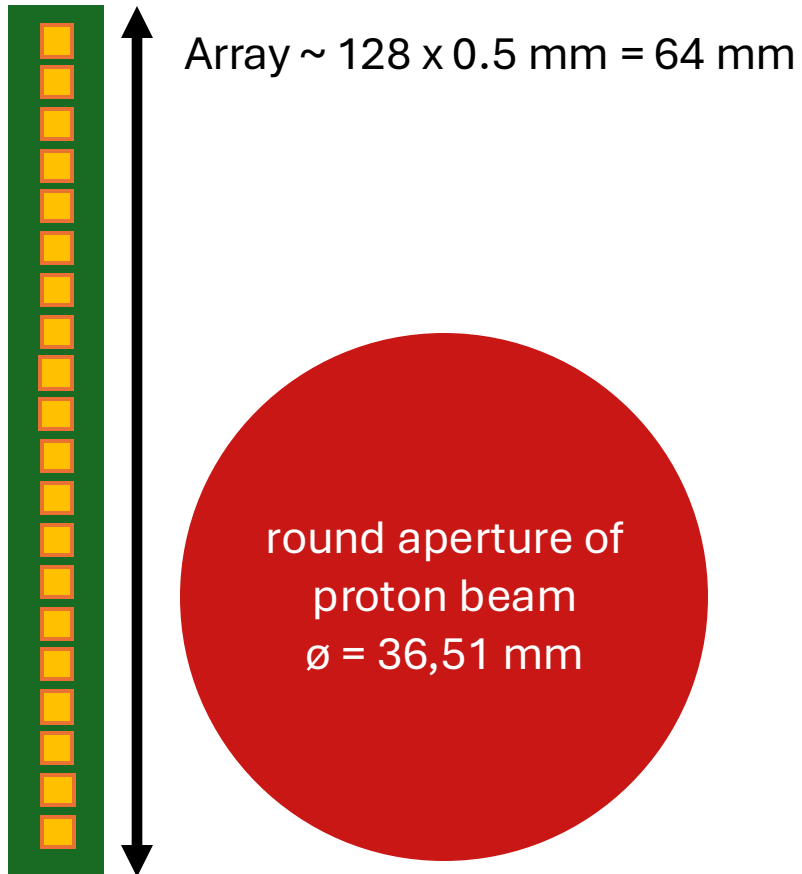
# My logbook

- My raw notes are added as scan to the results folder, if you want to look up some measurement details!

# Images – Array 1

So far without normalization, as I need to recheck and maybe re-adapt the code for this. Keep in mind that the diode response looks very homogeneous, but I have not verified this with the y-translated measurements yet.

# Further details



We only cover a part of the array in one measurement – we thus decided to make a map for the upper part, middle and lowe part of array 1!

For array 3 the smaller step size made the measurements too time-consuming for the time we had left.

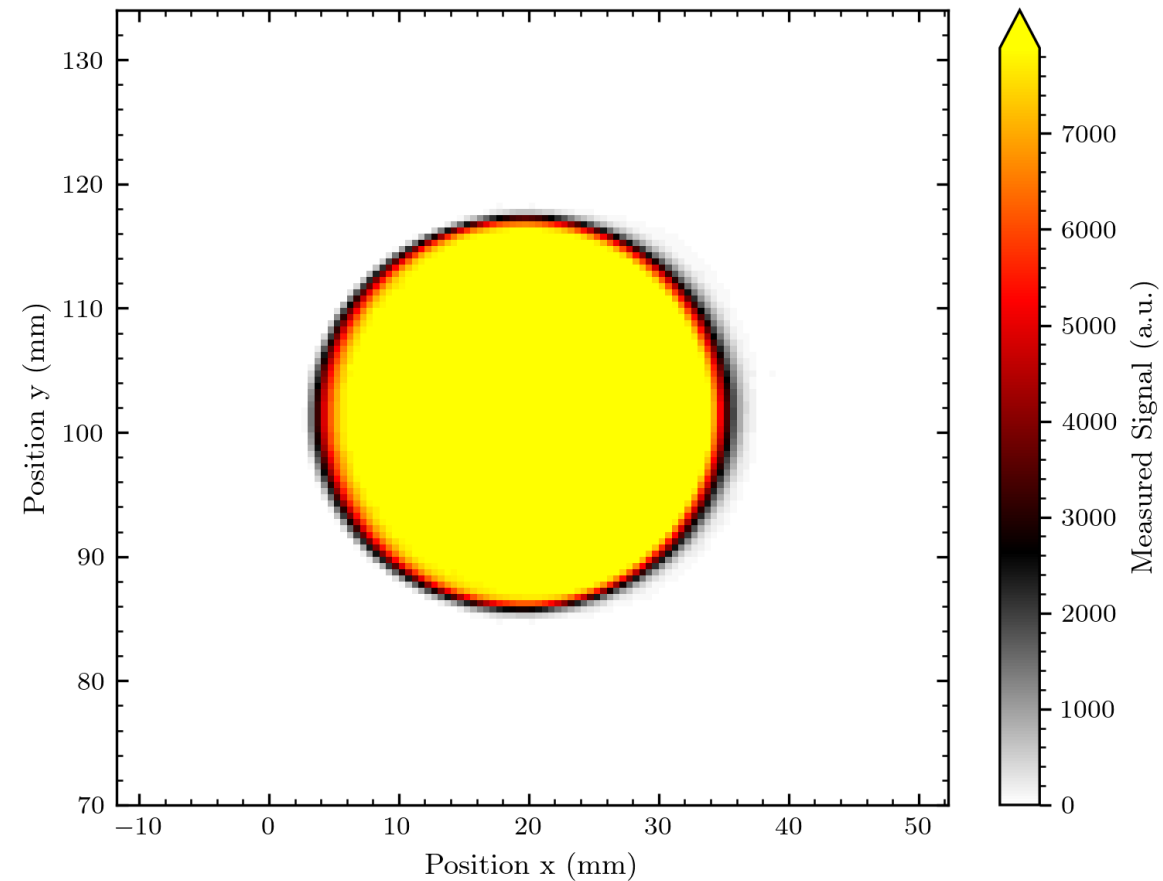
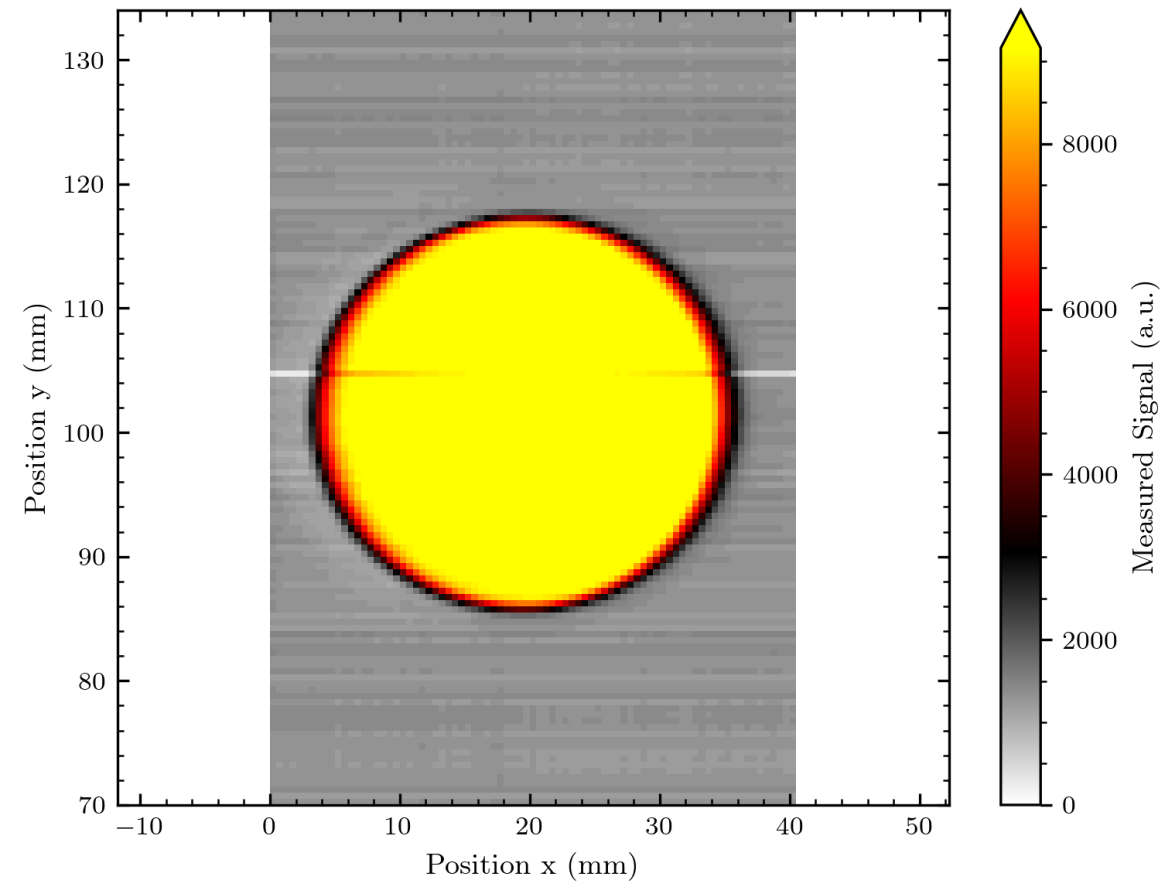


# Other infos

- So far the images are with 0.5 pixels, I will add plots with the correct pixel sizes and white space in between from the info Matilde sent me for the new masks.
- The contoured (interpolated) plots are not influenced by this

# Background subtraction

- In the images I already sent around the background was not subtracted! How are the images looking after doing this?



The quality without normalisation is perfect – as it seems! (But I still need to verify this with the y-translated data)

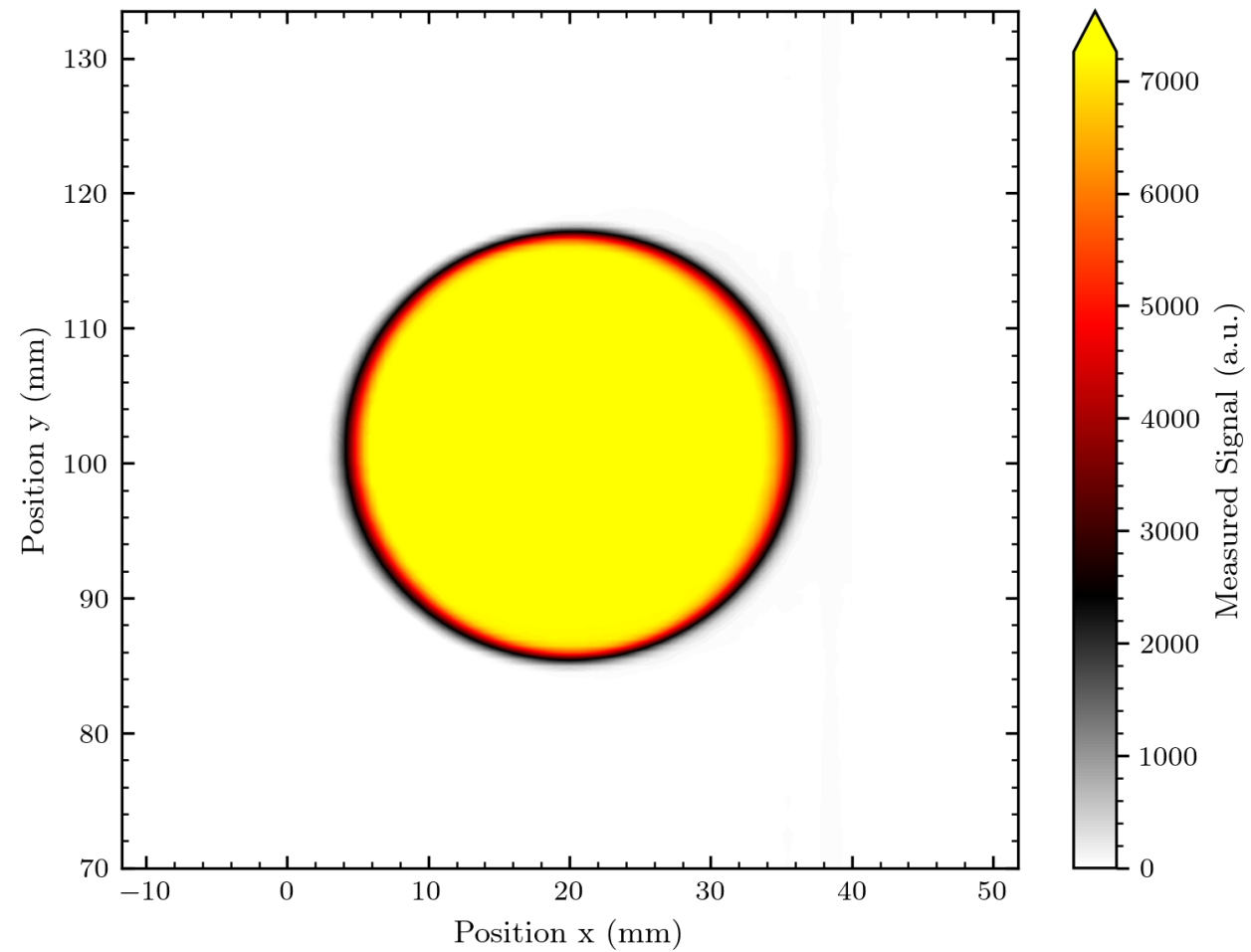
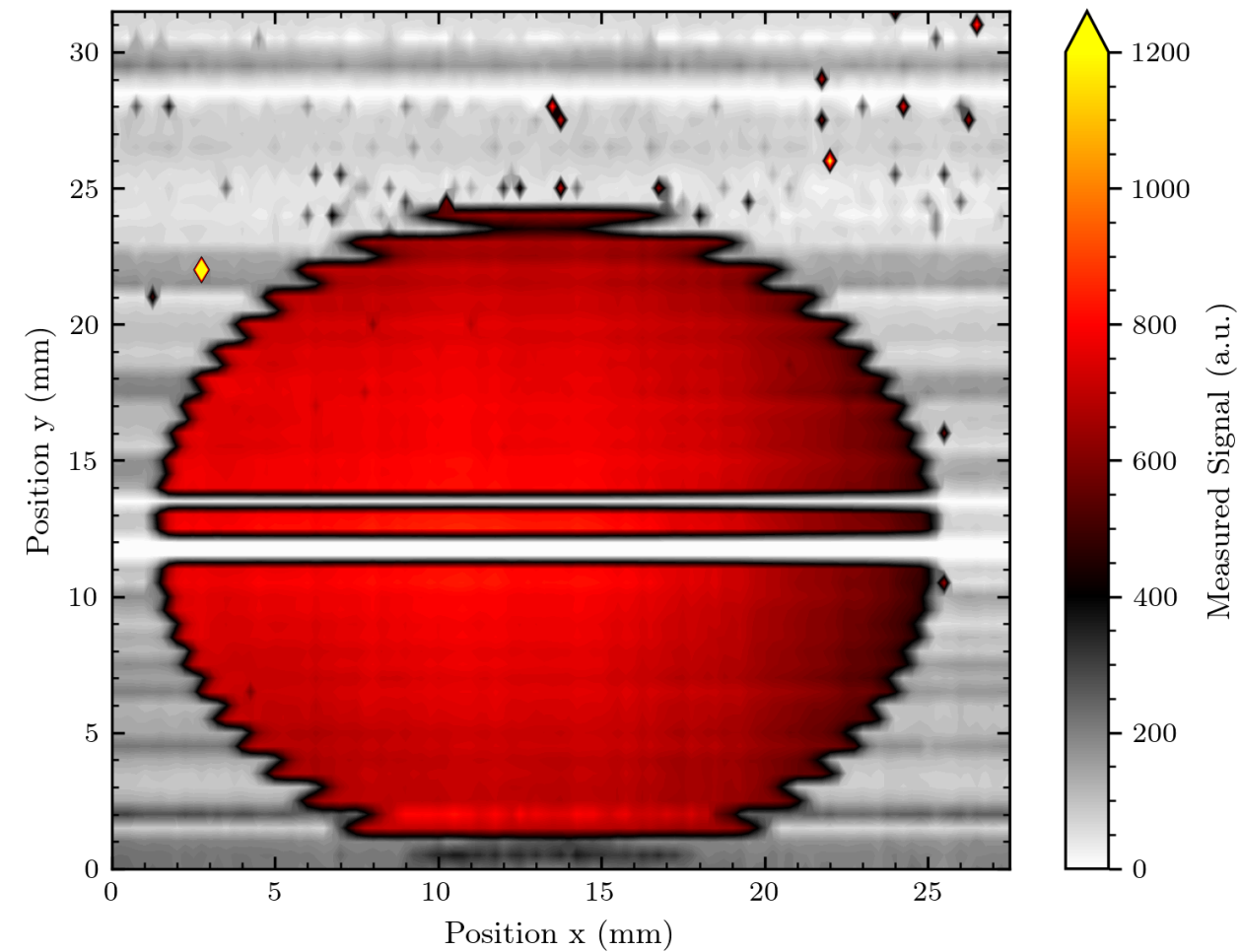
Thus there will be a lot of nice zero white in the images!

# Fanout (old) vs direct bond (new)

I'll add info to make the signal levels and other aspects easier comparable...

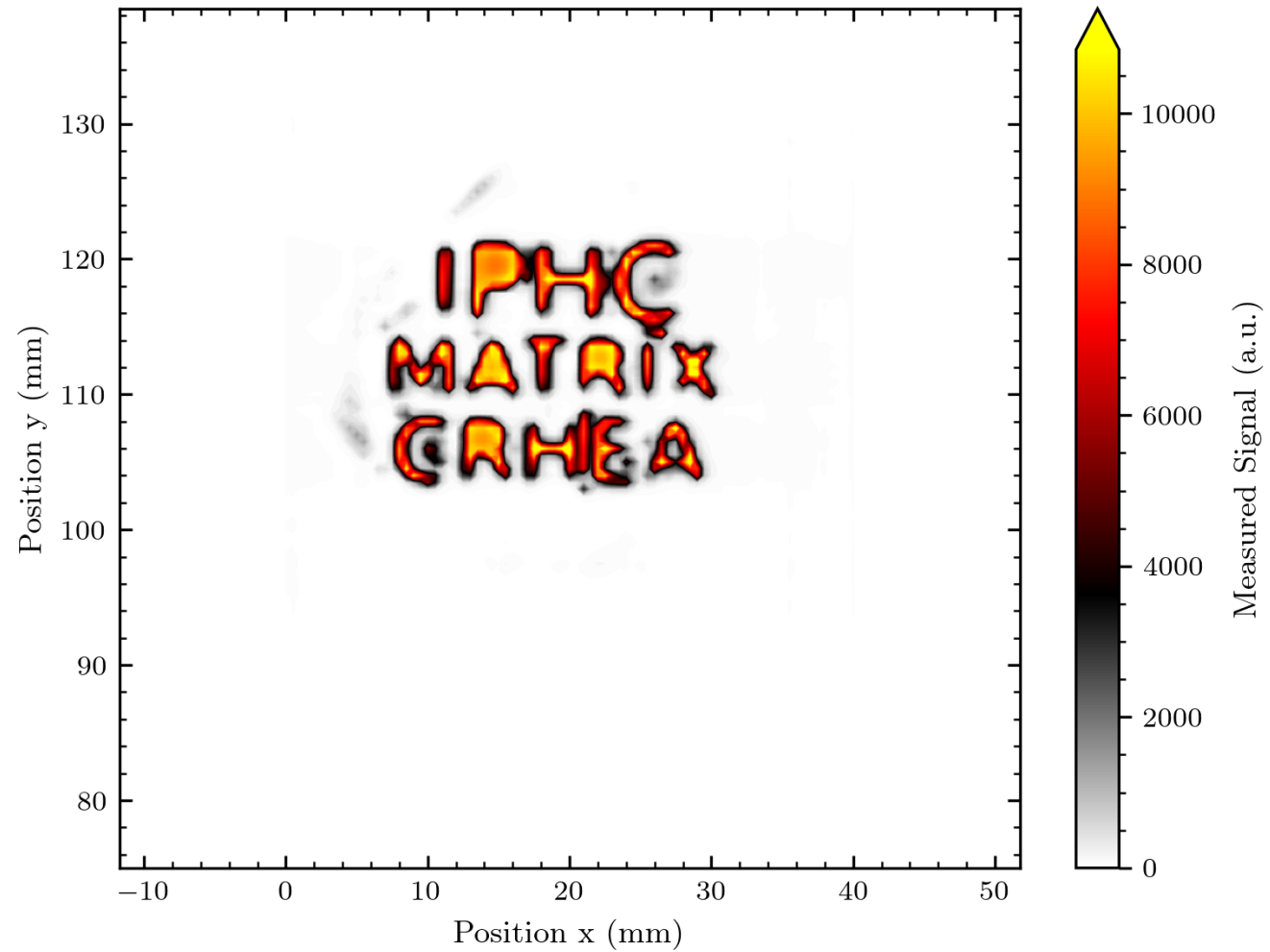
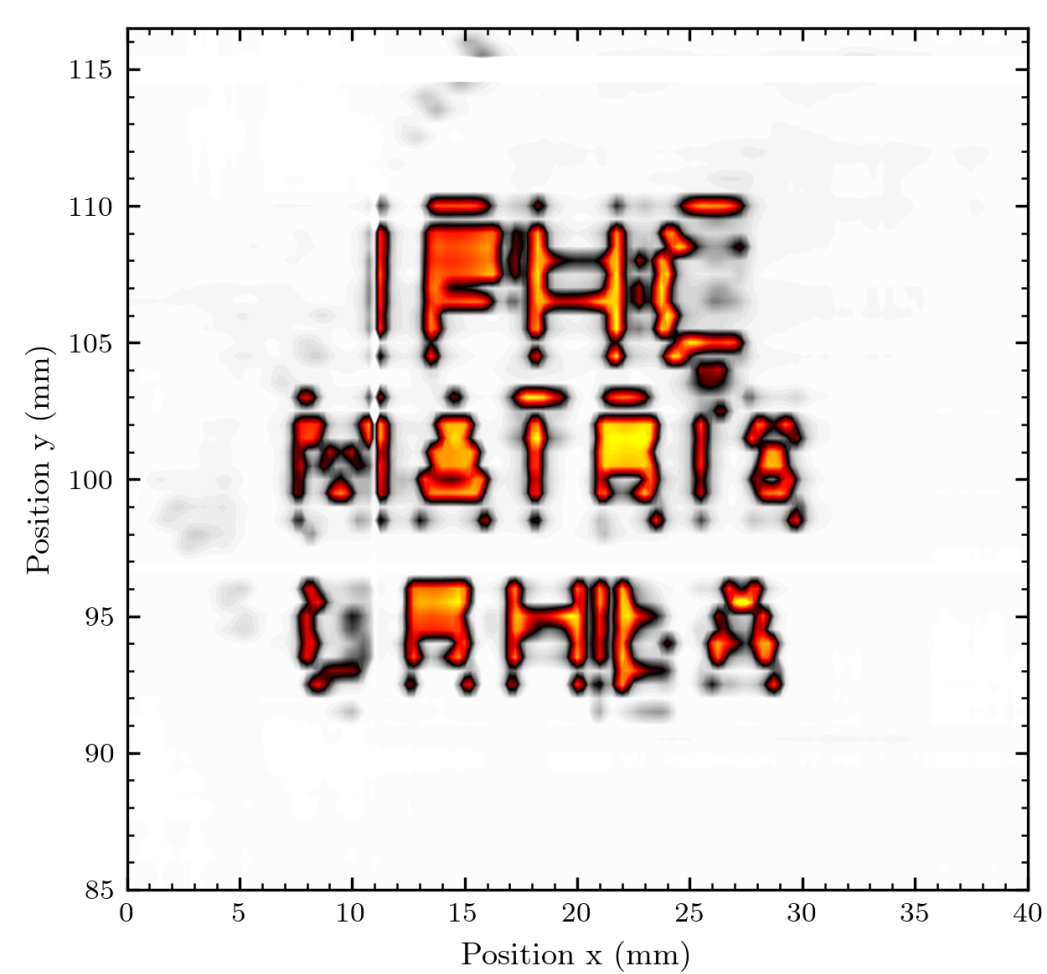
Note that the old images are a bit distorted, I'll apply the new scaling routine on them

# Round aperture

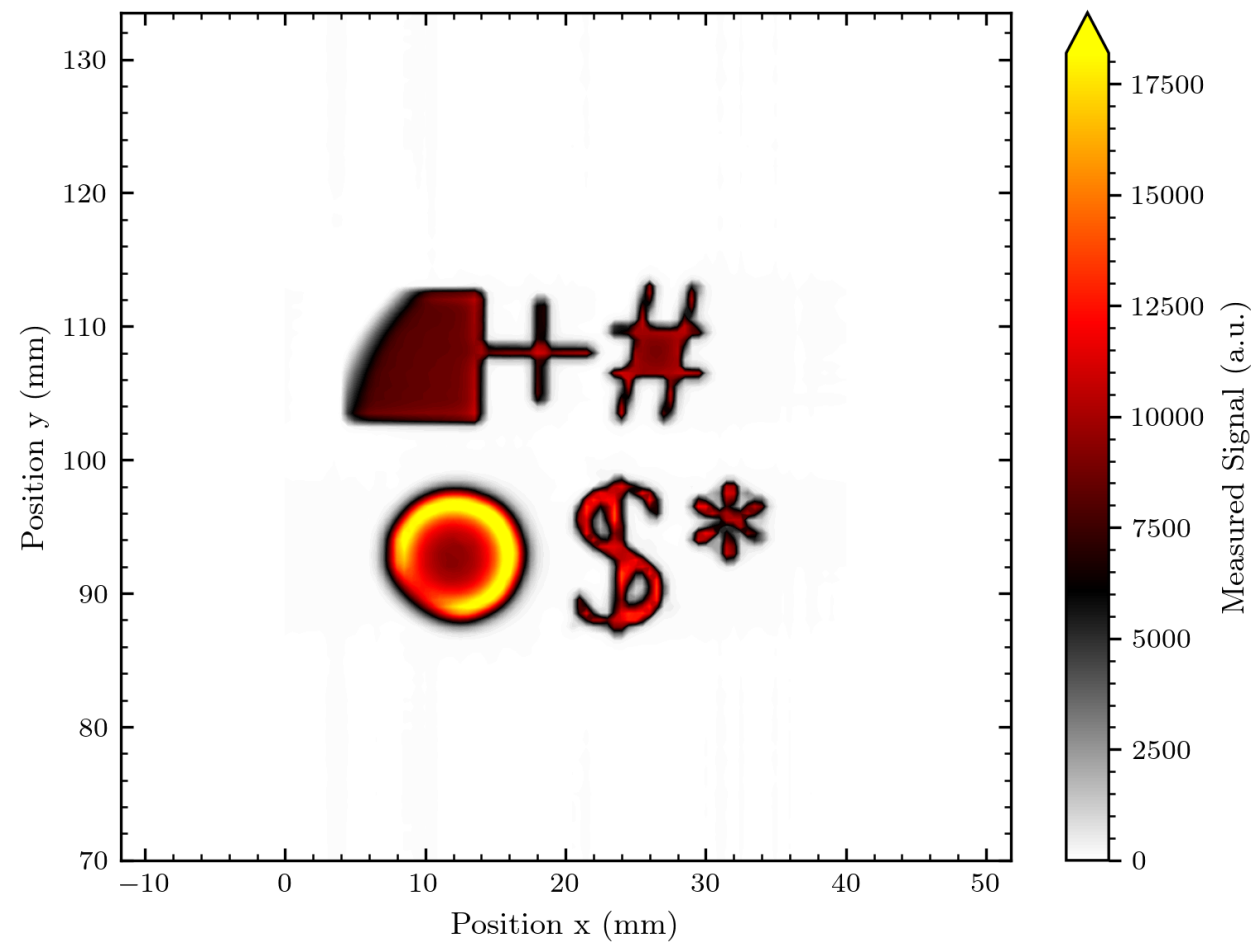
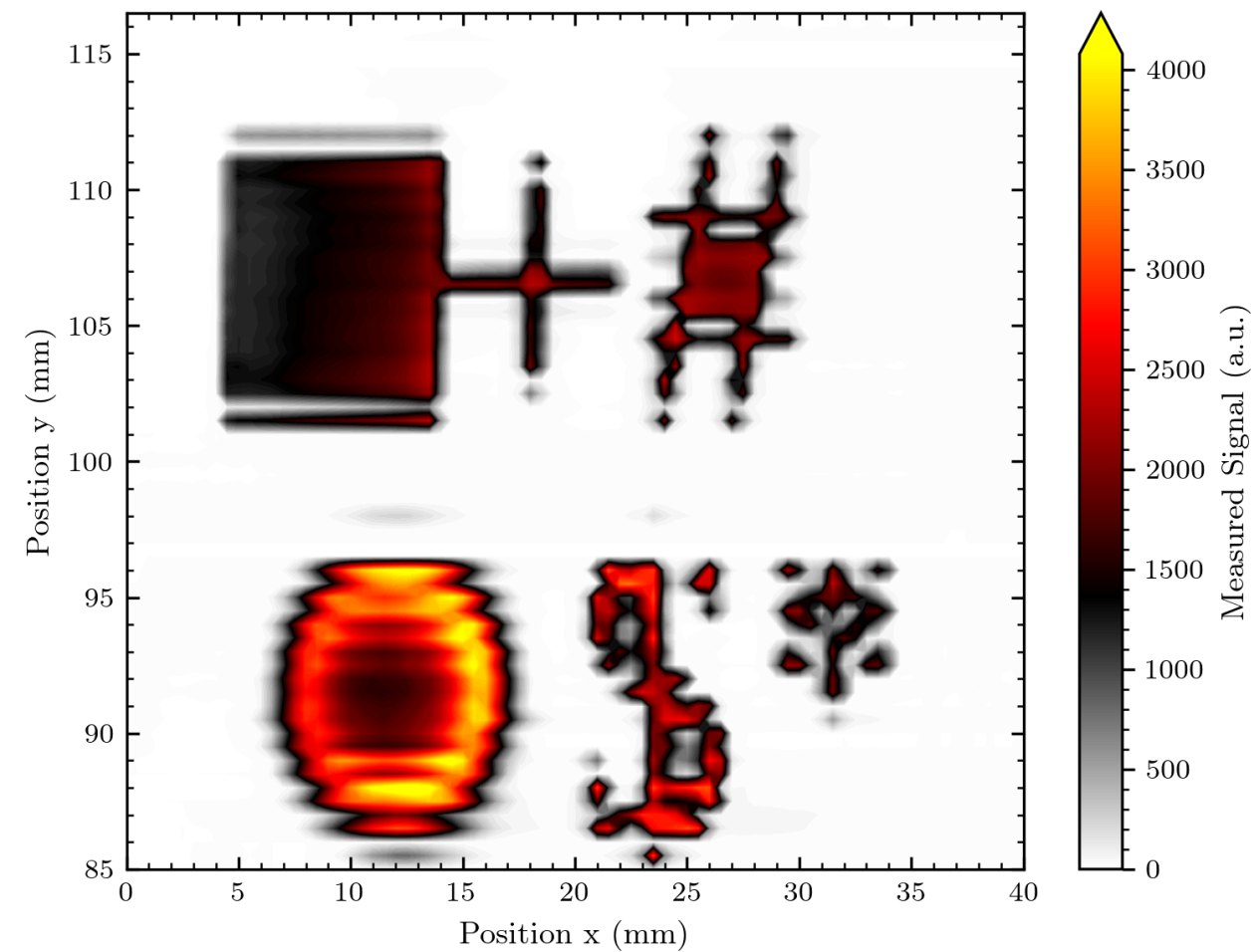




# Logo



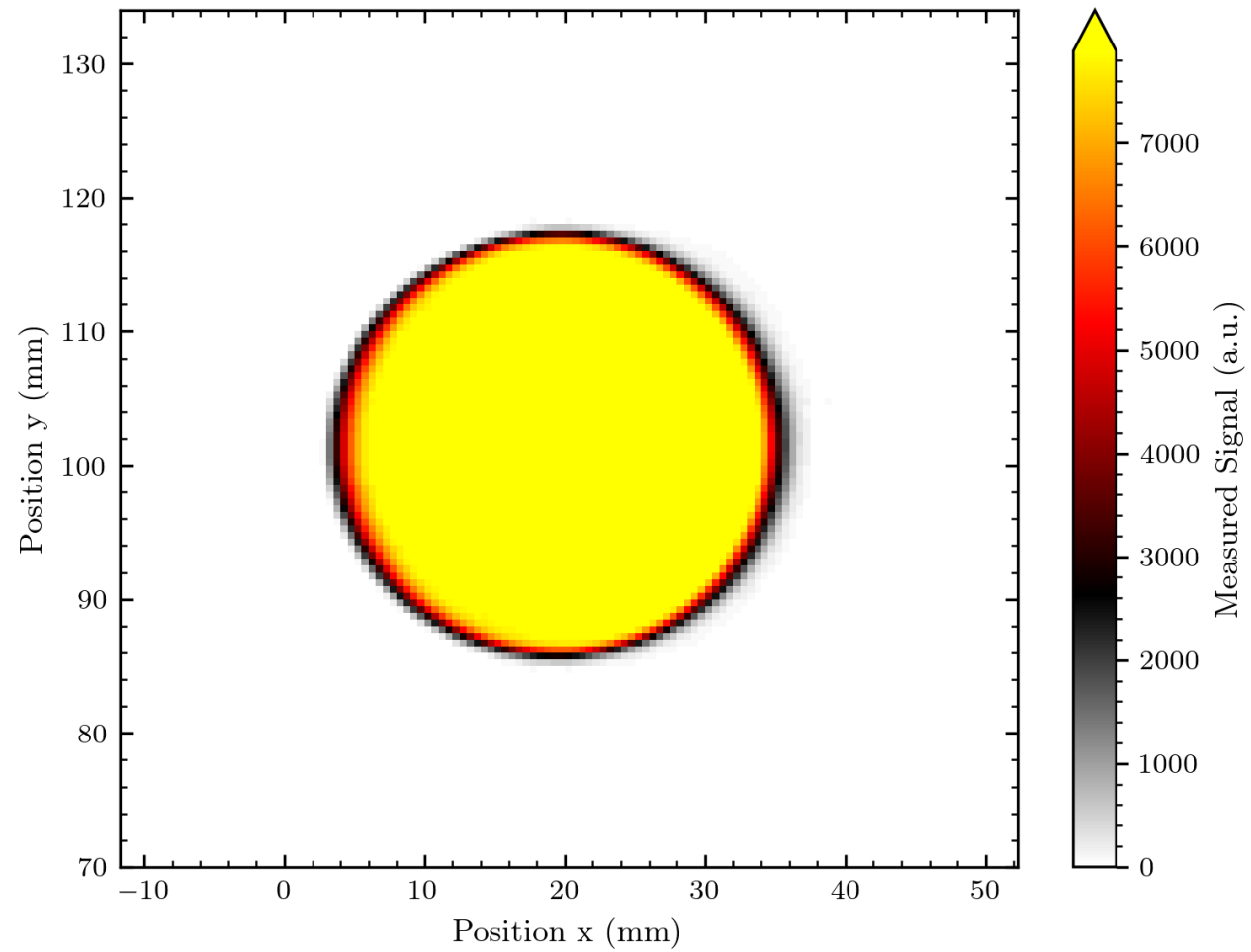
# Misc shape



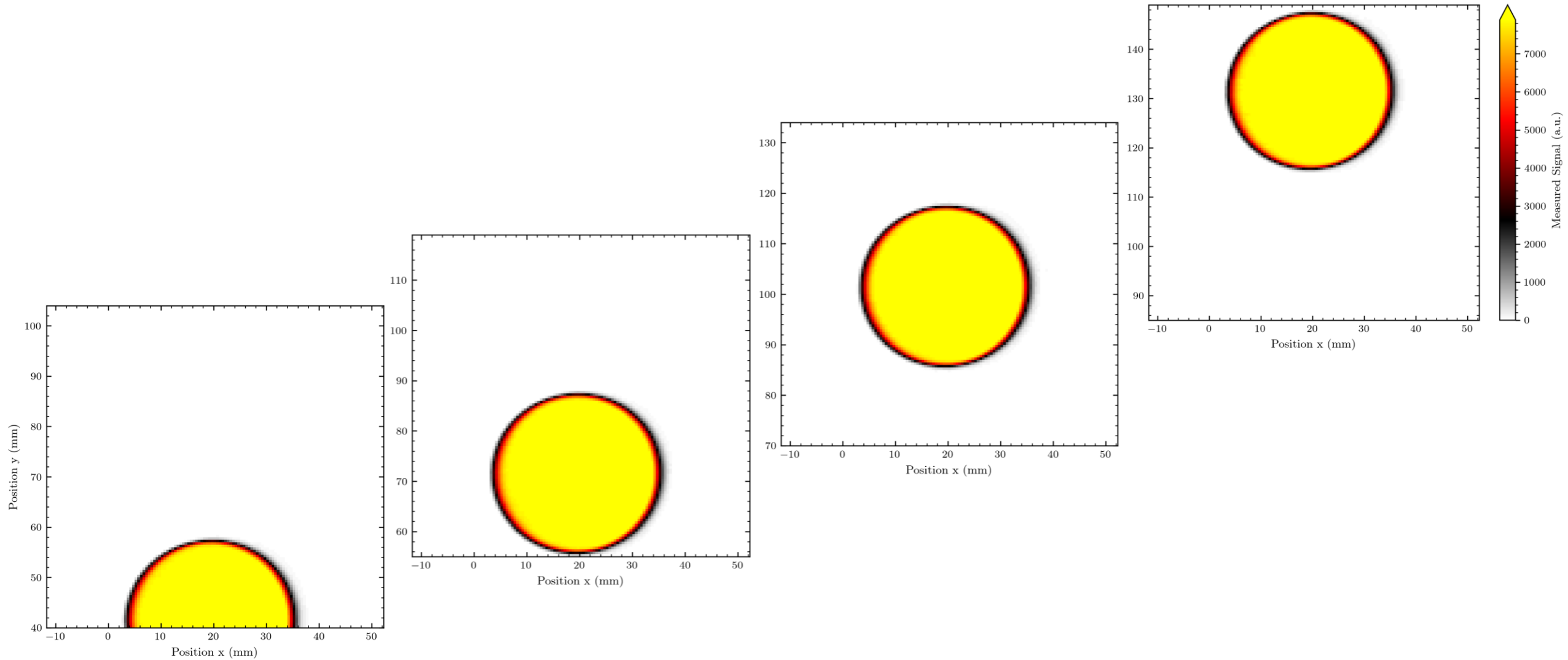
The protoemission has  
disappeared?!!

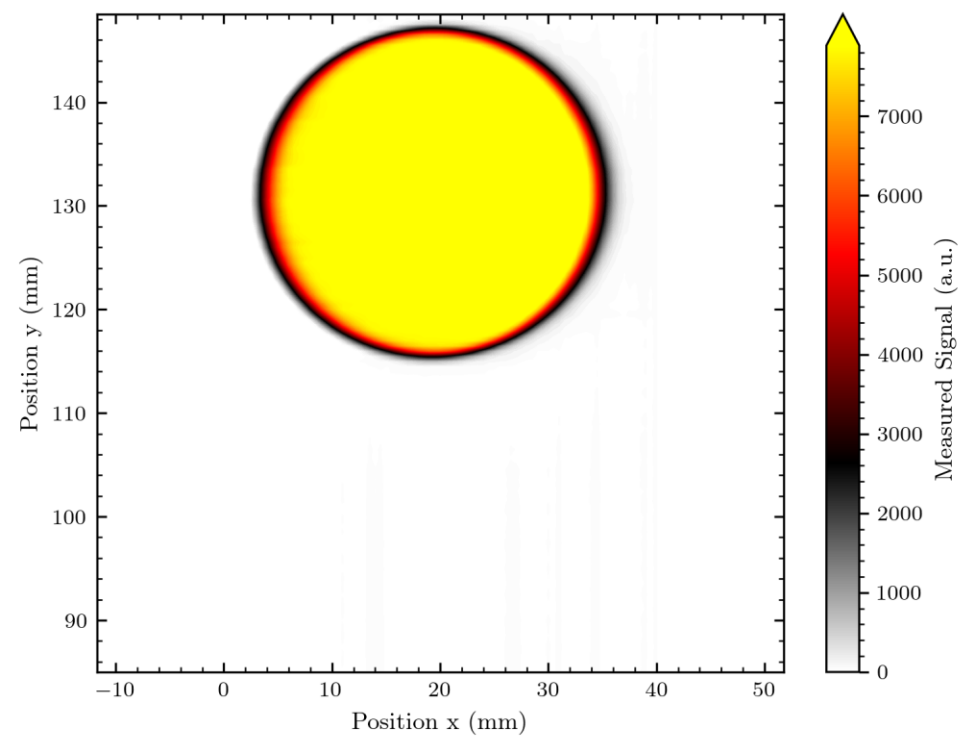
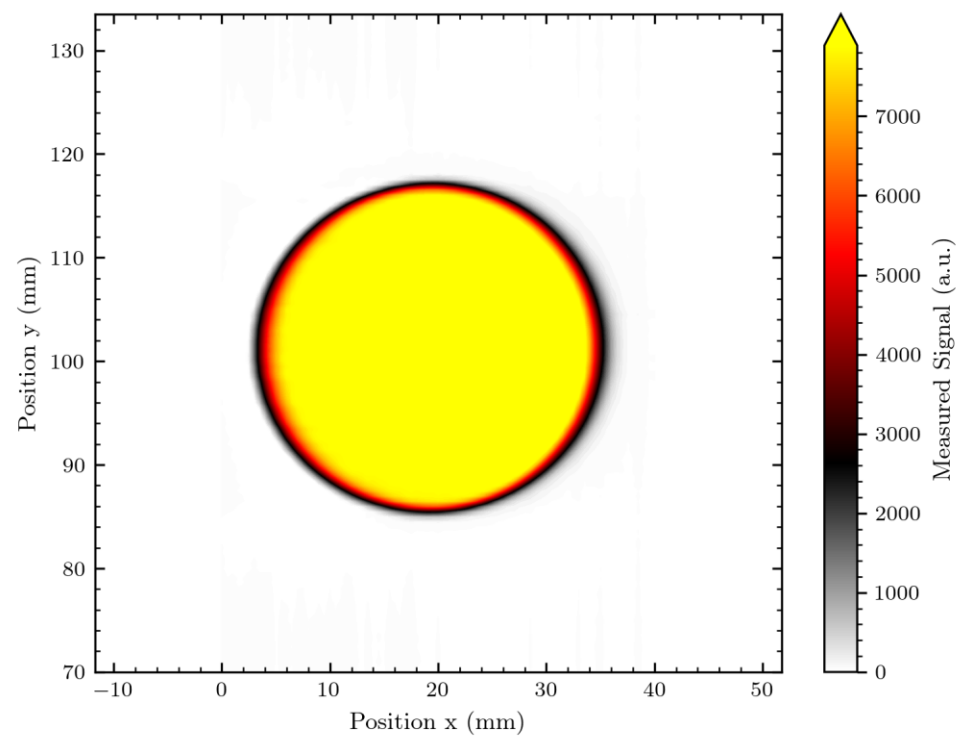
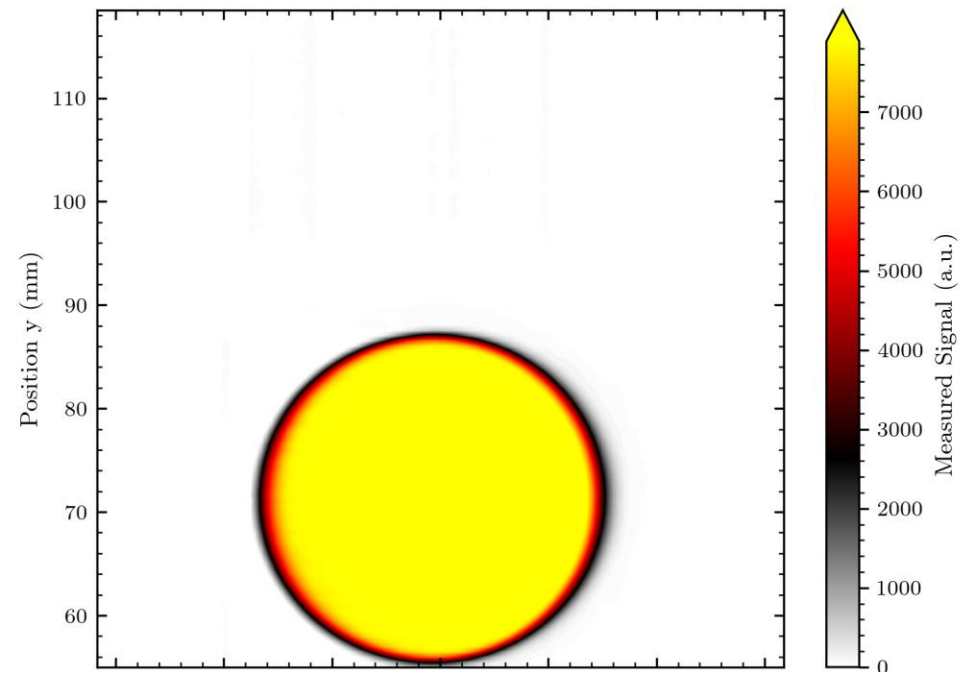
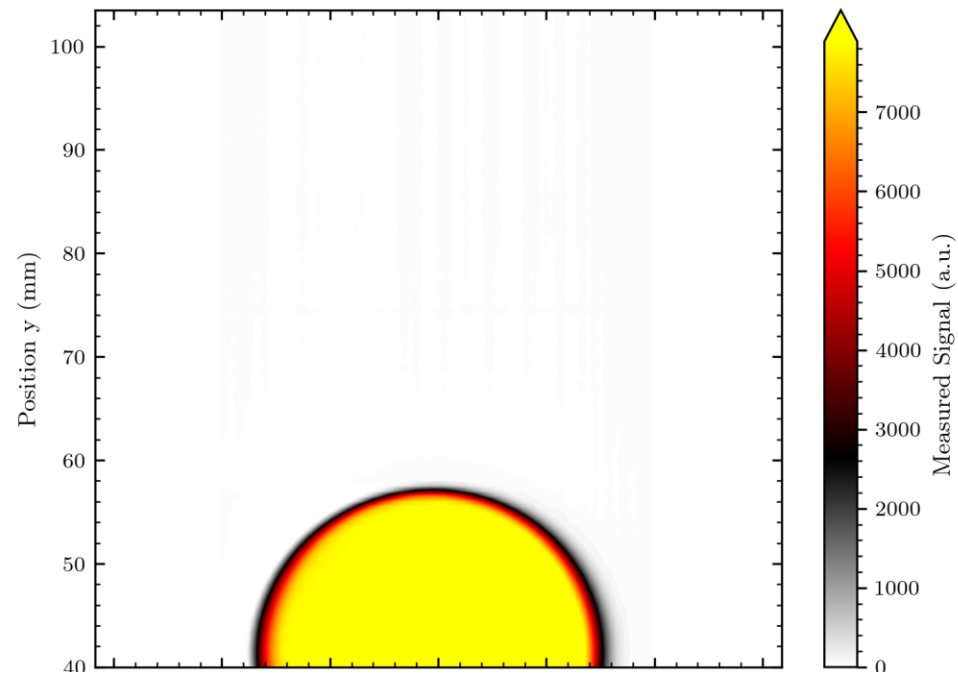
Our imaging quality and  
reliability is drastically  
increased!

# The round aperture



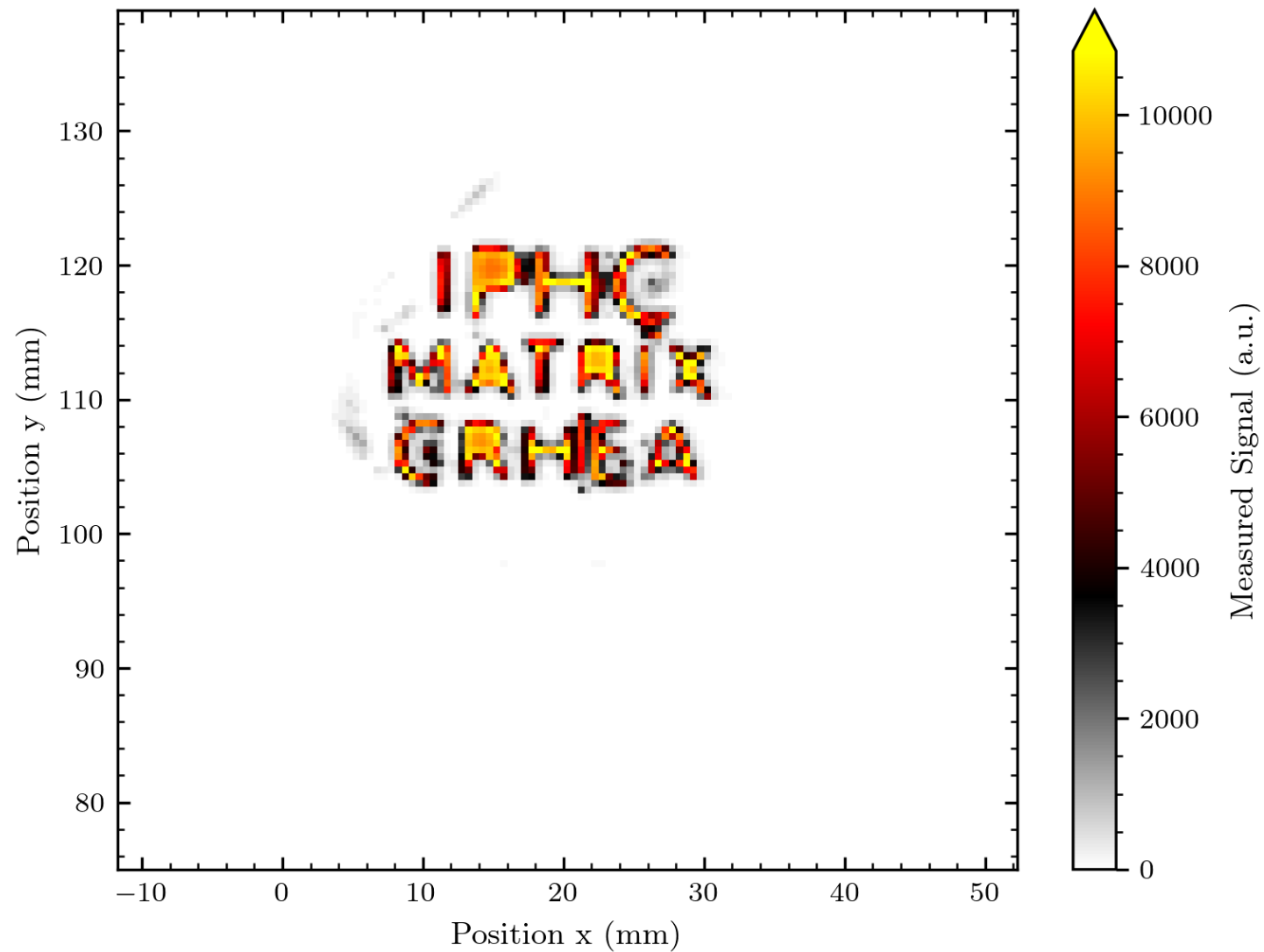
# Sunrise of the proton beam ☺

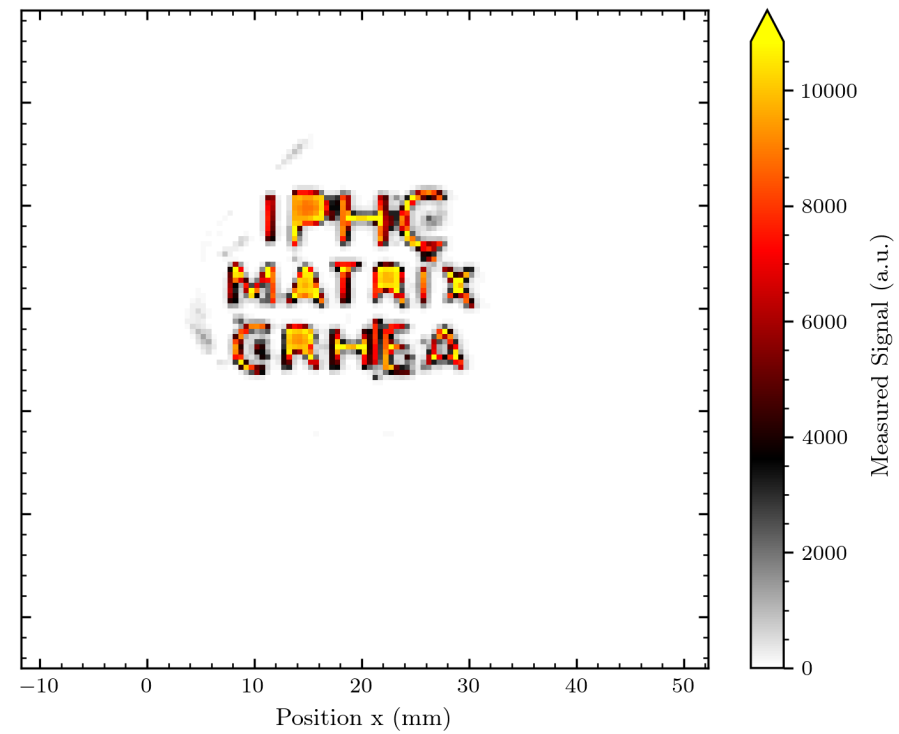
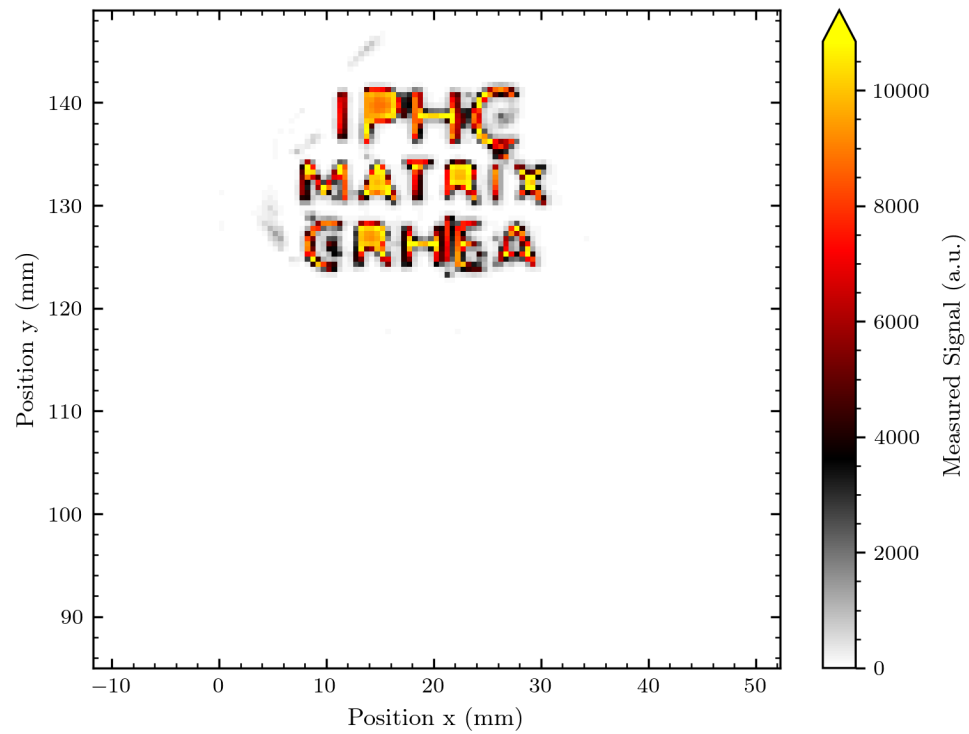
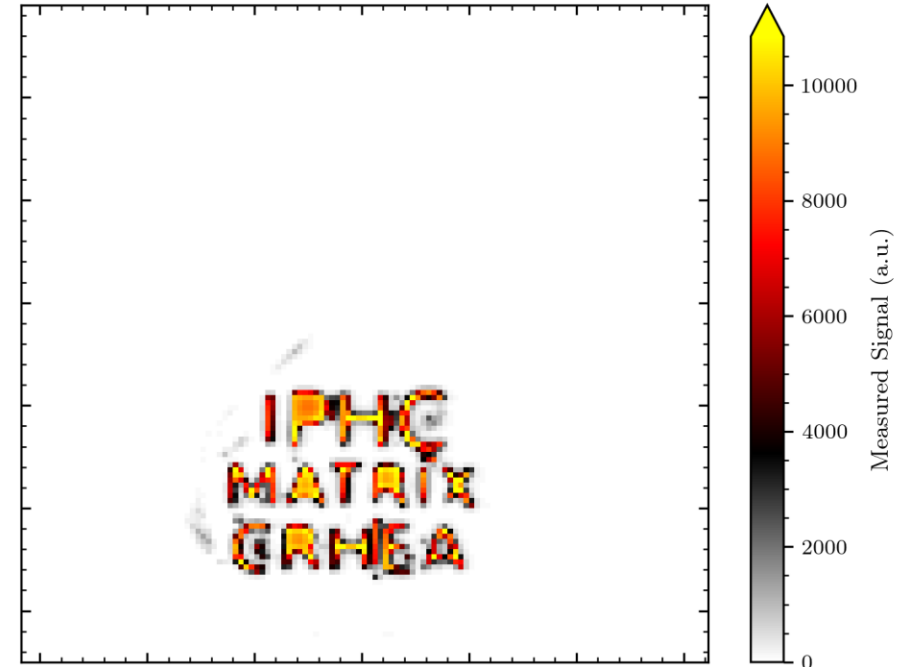
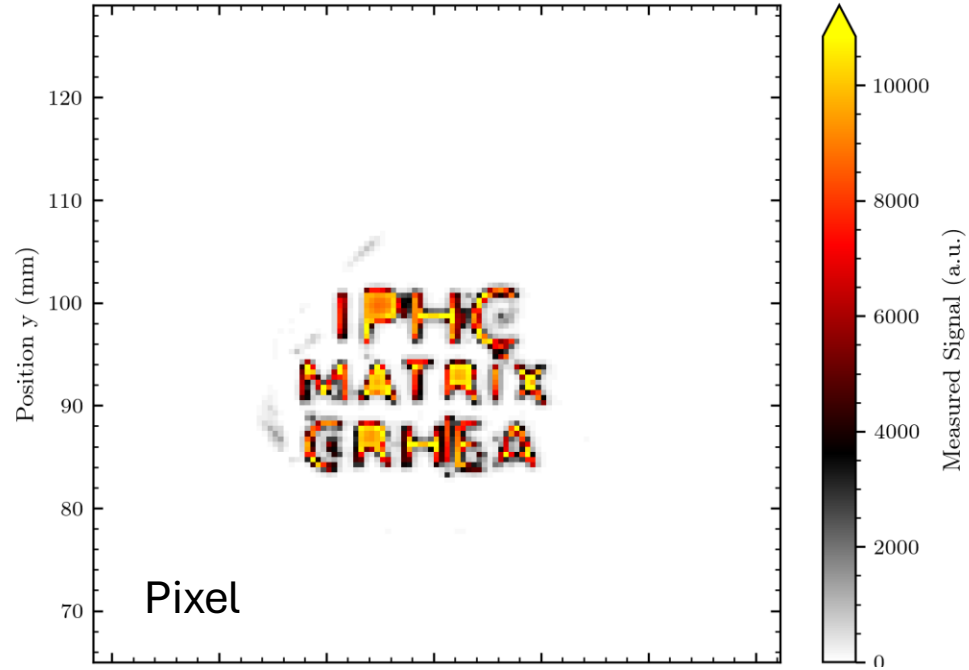




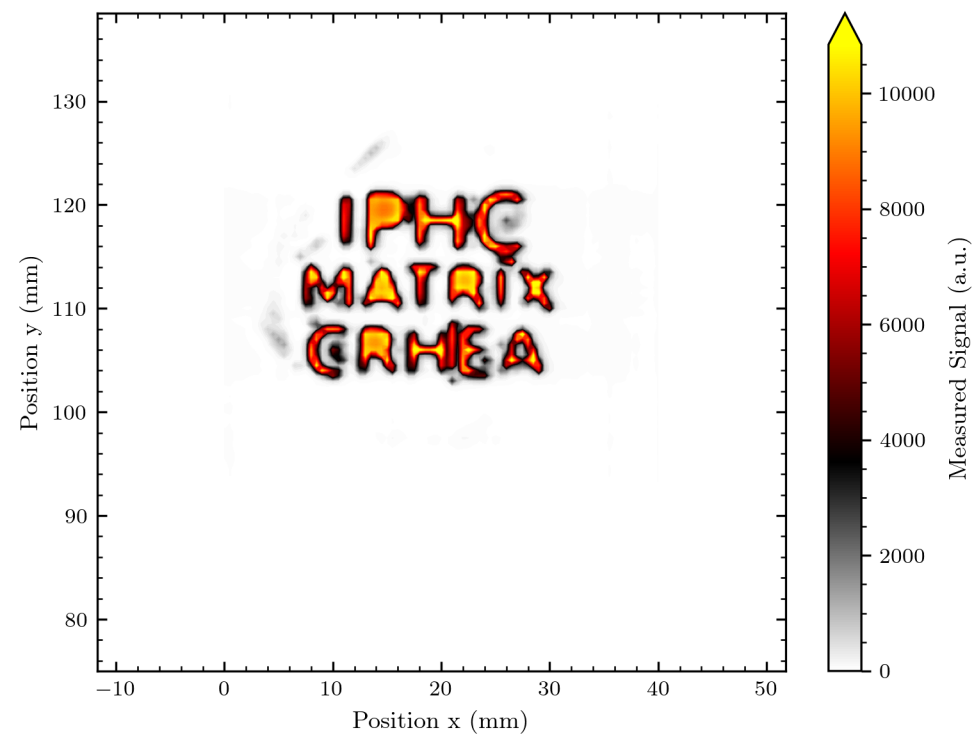
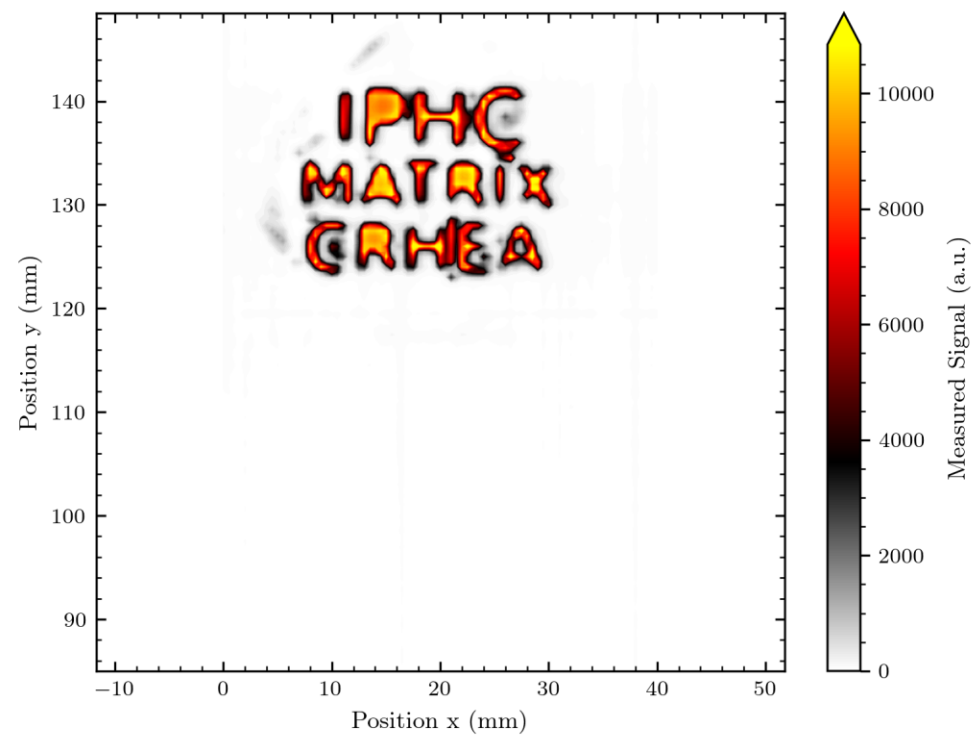
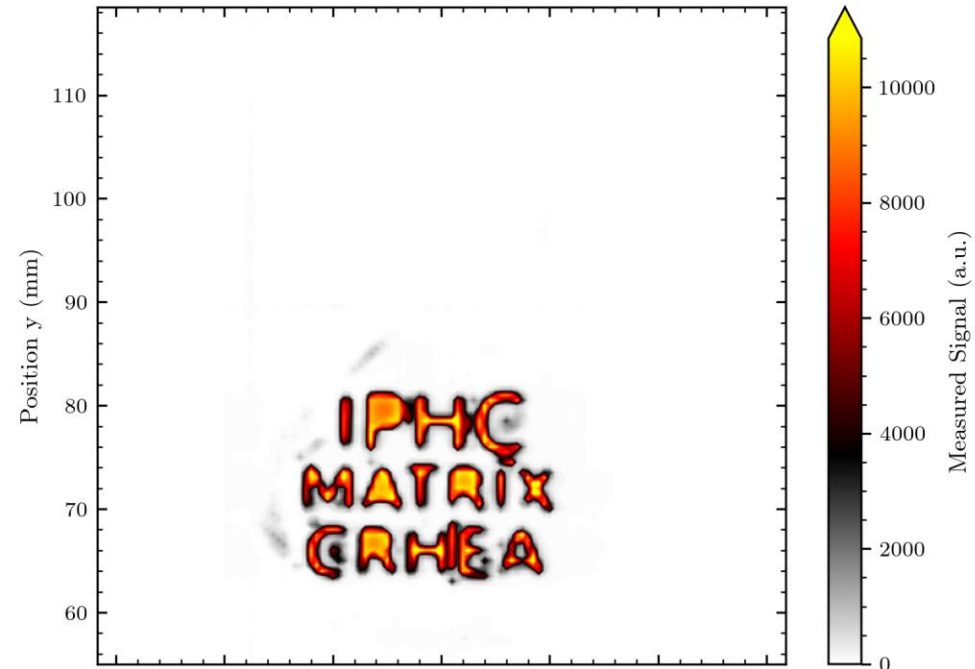
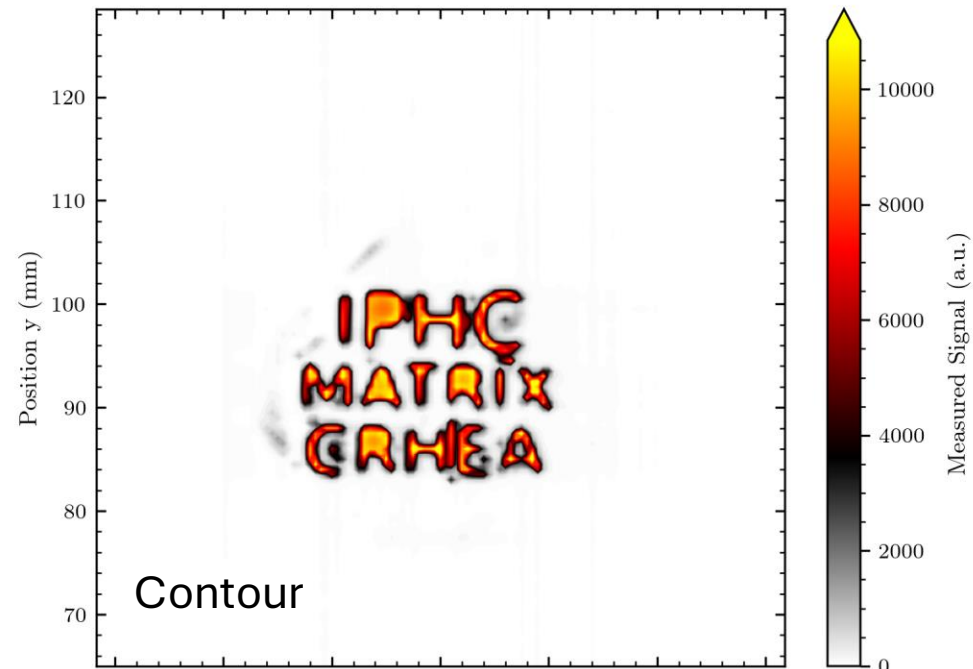


# The Logo



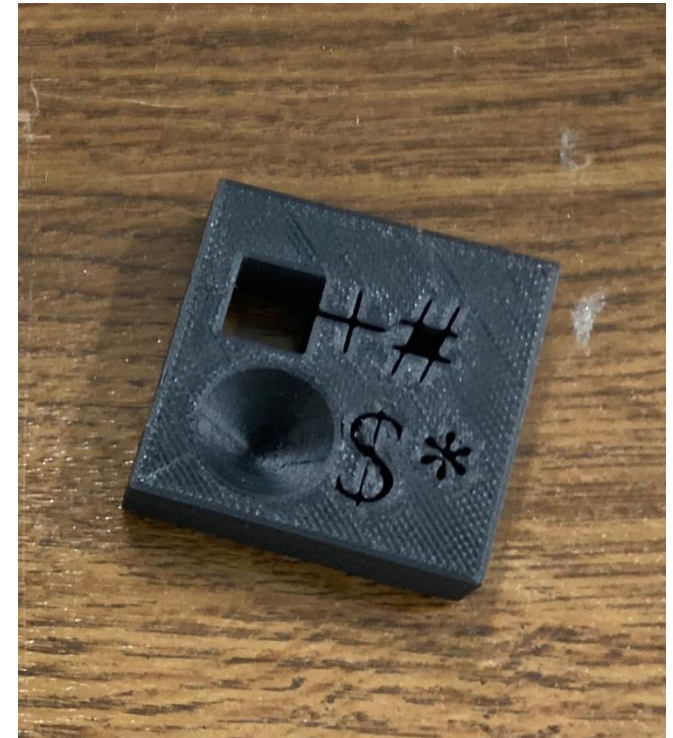
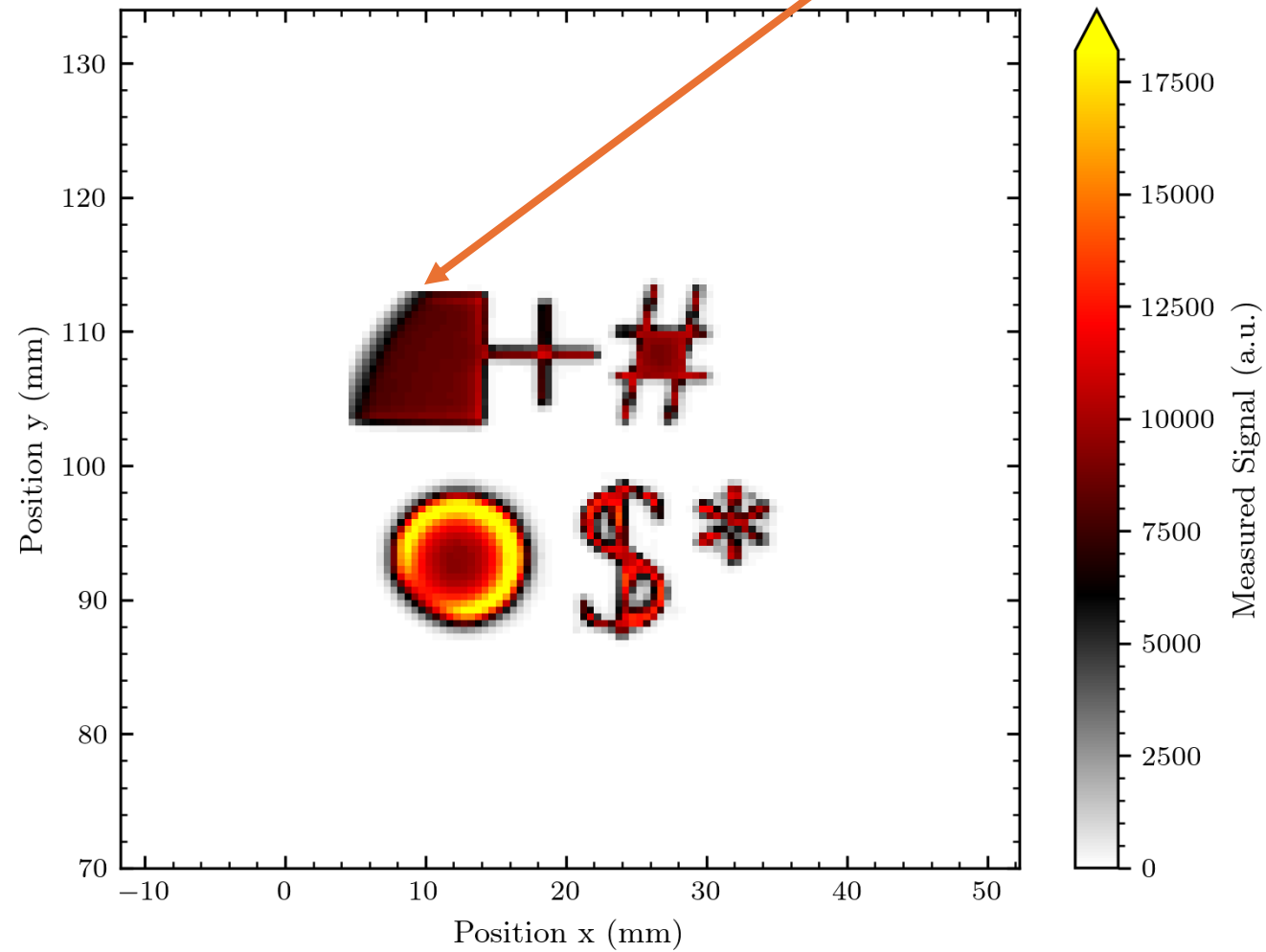


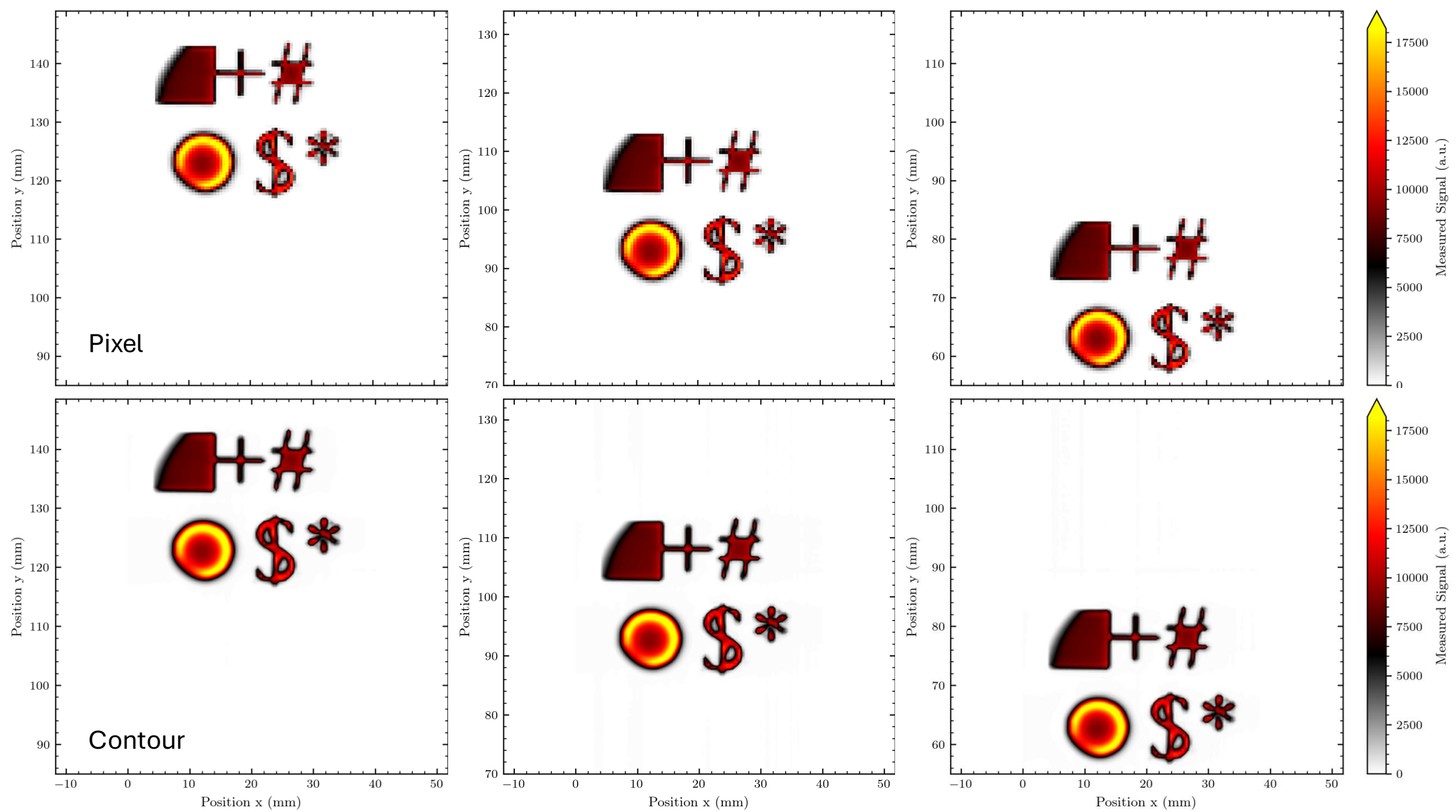




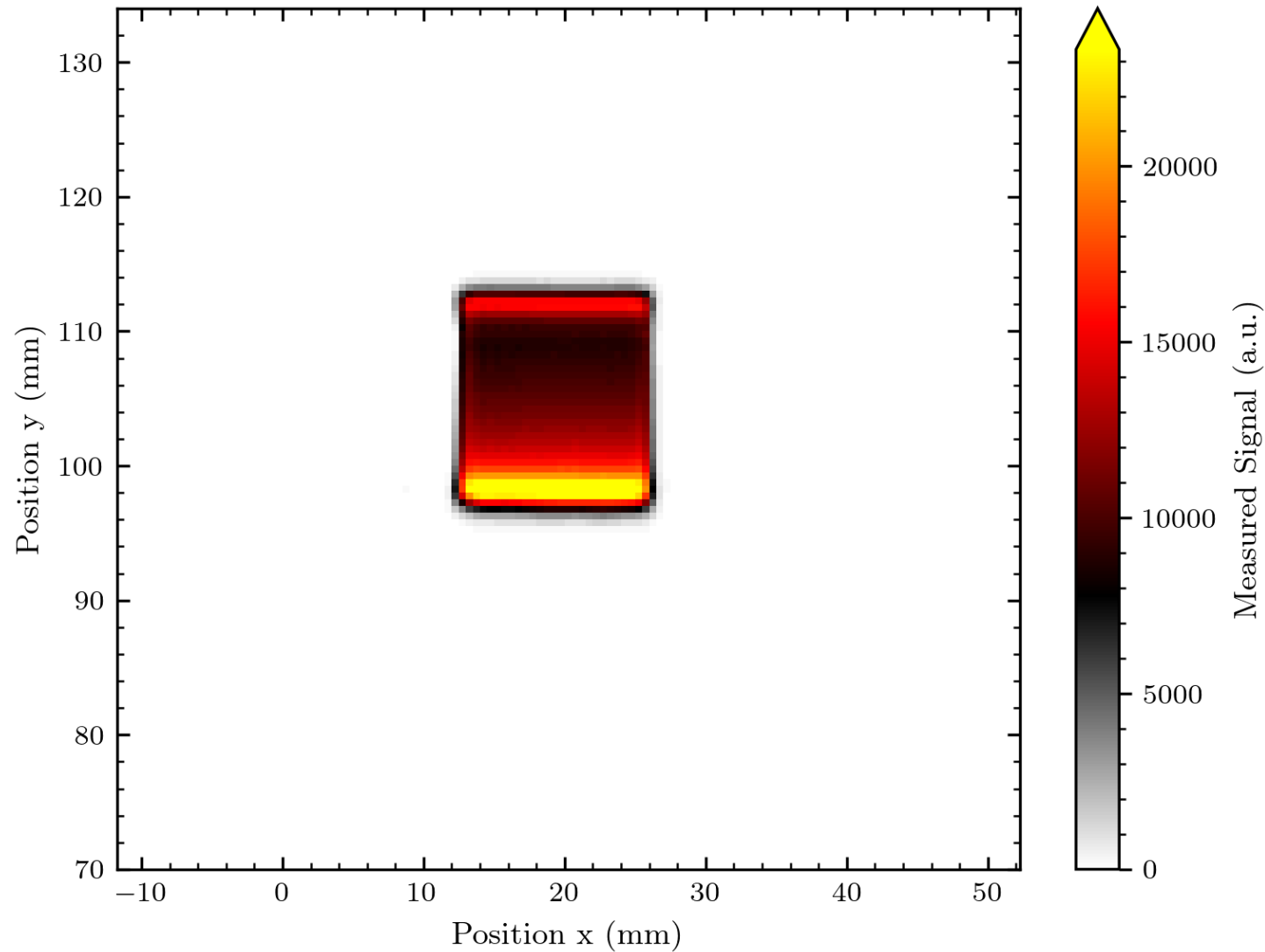
# The misc shape

Seems like the shape was shadowed by something



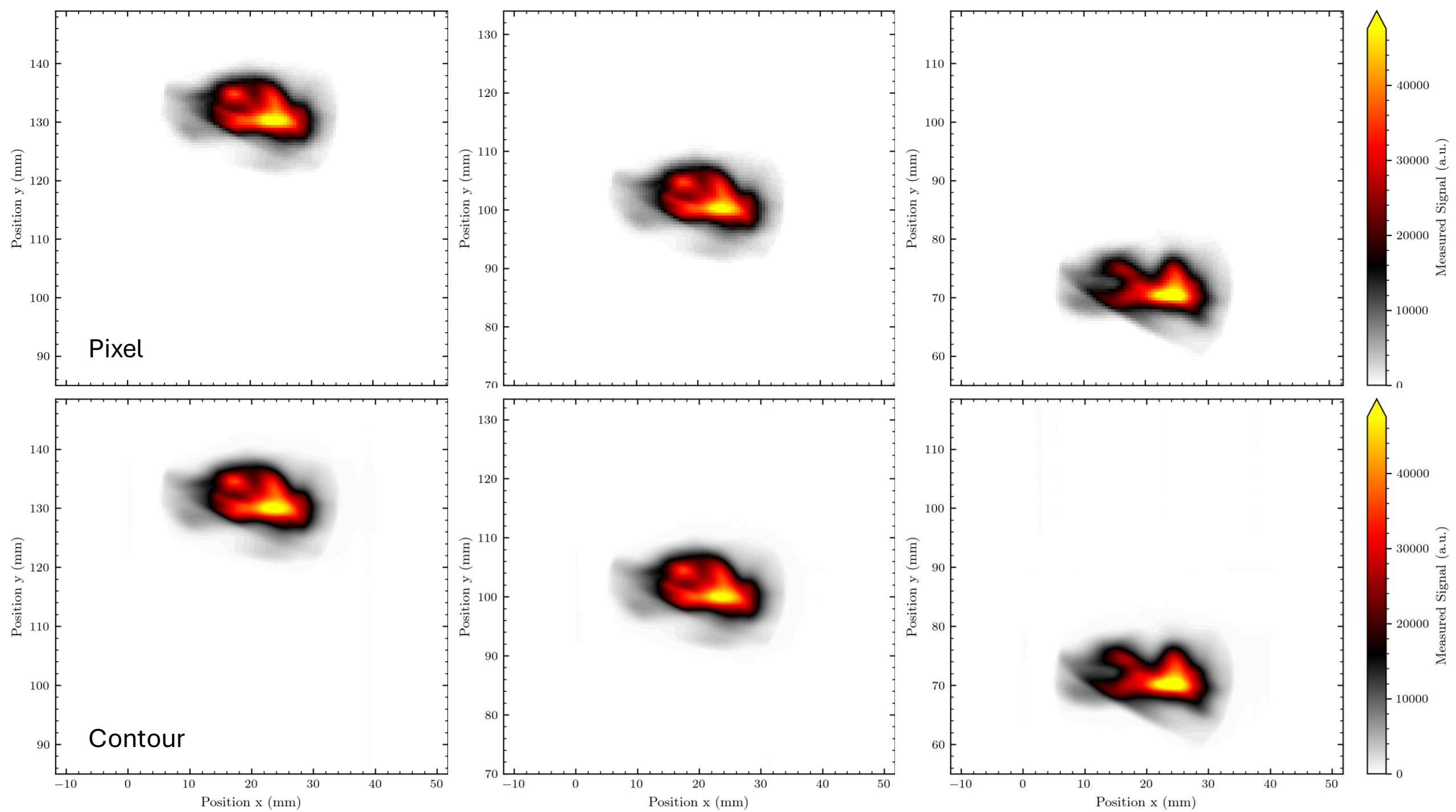


# The Bragg peak (only 1 map, but y translated data)



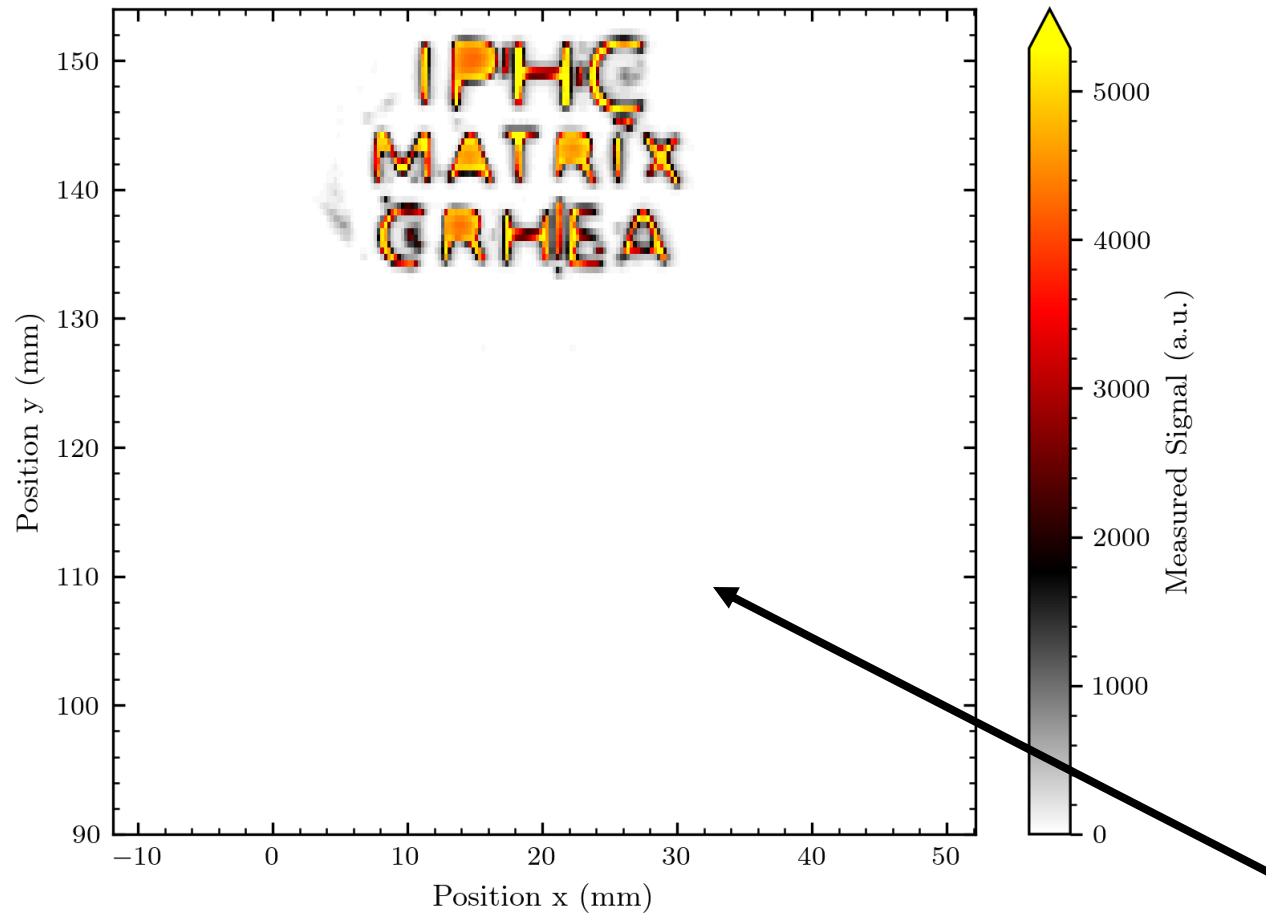
# The beam shape without diffuser

We actually see a change in the beam between measurement 2 and 3 – this is a prove of our beam imaging ability. Maybe we can make some timelapse of the beam on the next measurement day!



Array 3 – higher resolution?

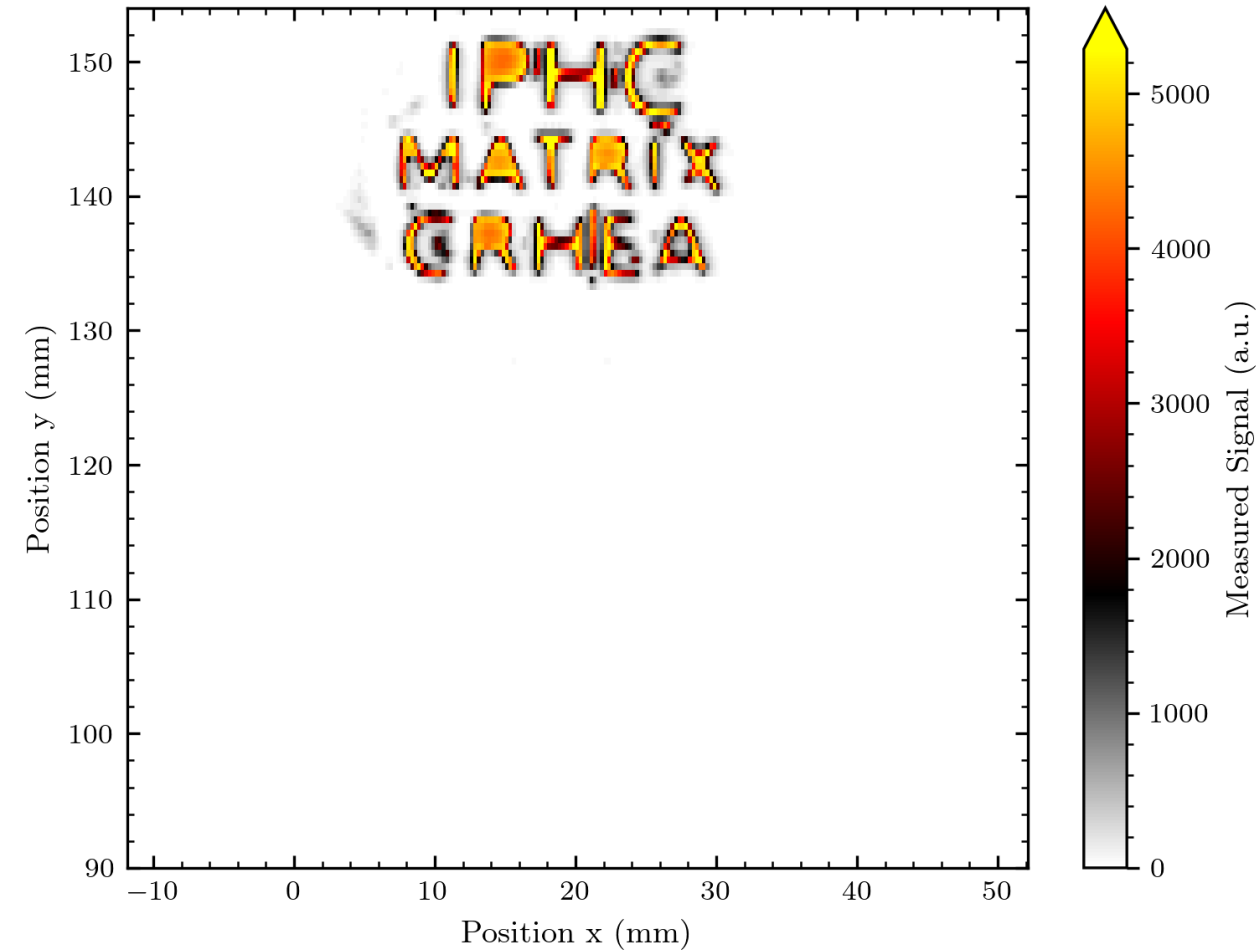
# Logo



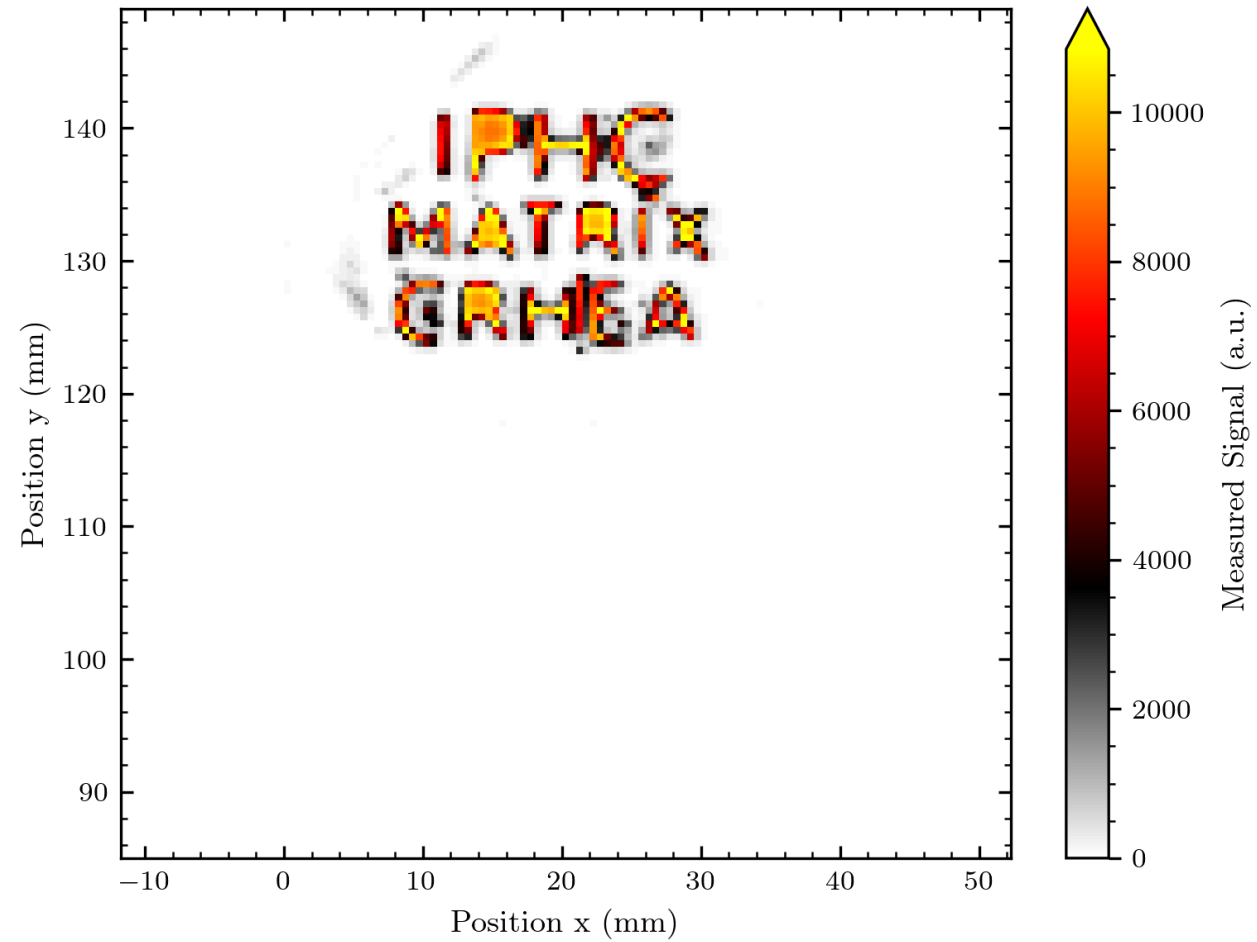
There was one diode maybe not working down here, thus we scanned the image in the upper array part!



Smaller diodes 0.25 mm in scan direction +  
0.25 mm steps



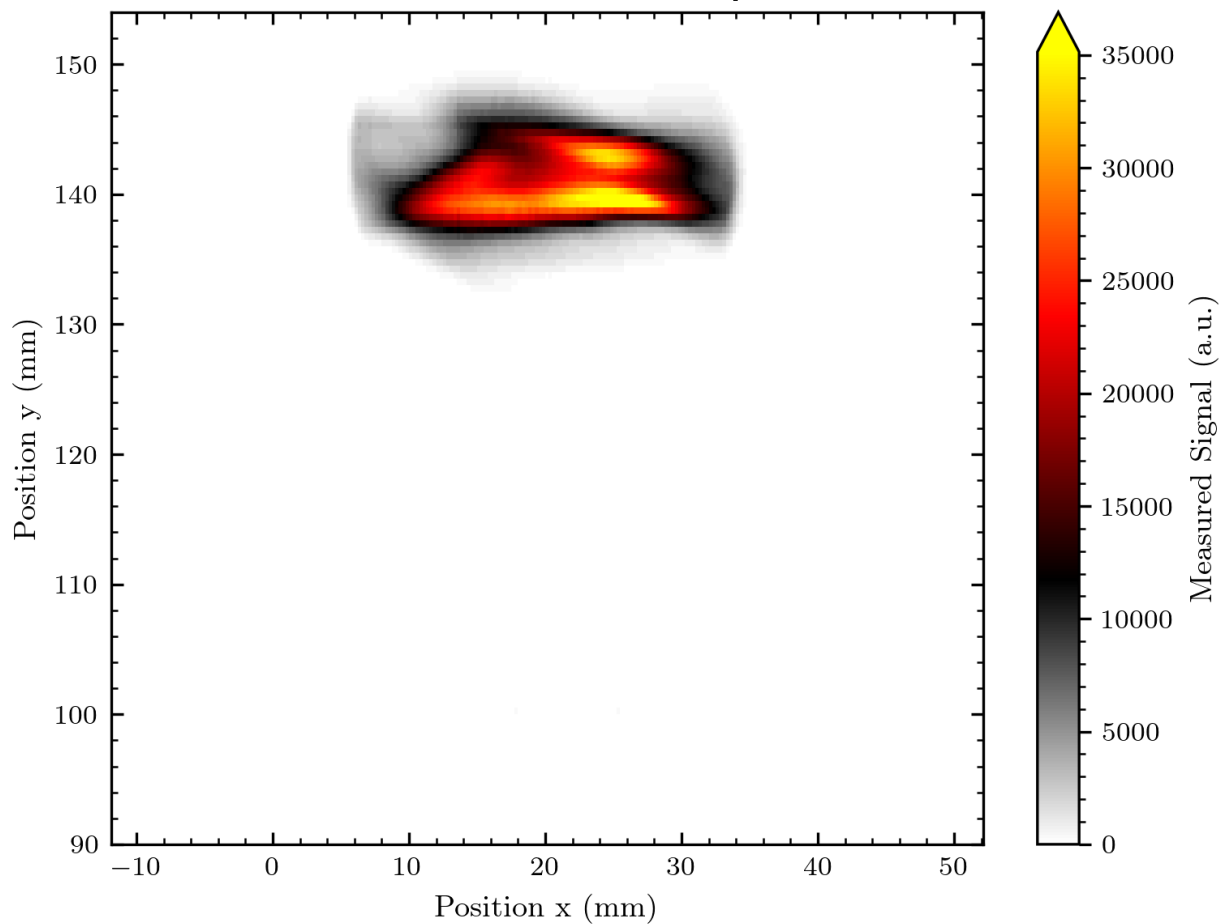
0.5 mm diodes + 0.5 mm steps



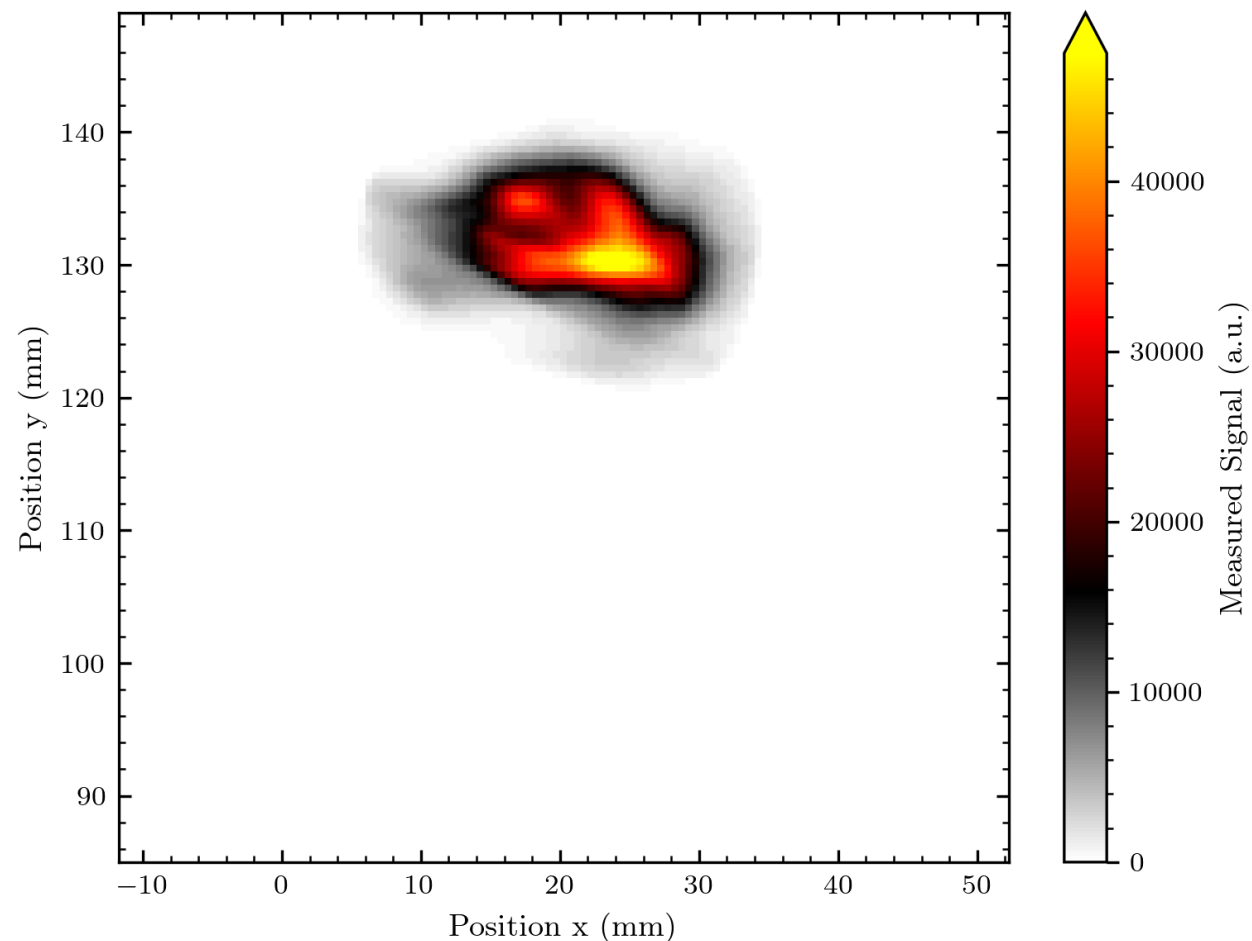
Looks successful, note that the signal is also nearly exactly halved (as supposed to happen)

# Beam Shape

Smaller diodes 0.25 mm in scan direction +  
0.25 mm steps



0.5 mm diodes + 0.5 mm steps



(quite some change within our measurement day)

# What is coming in the next days

- Analysis of voltage scans (signal, noise, signal to noise)
- Analysis of y-translated measurements (how homogeneous is diodes response?)
- Normalization from y-translated measurements
- More details, image overlay?
- Bragg analysis and comparison with previous results
- Beam info I got from the Cyrcé crew (finally also for previous measurements)
- Suggestions for next measurements