PSI

SoM-CAM test with FW4Y signals - third attempt and MRI9B measurements

HIPA Diagnostic Upgrade Meeting

December 3rd, 2024

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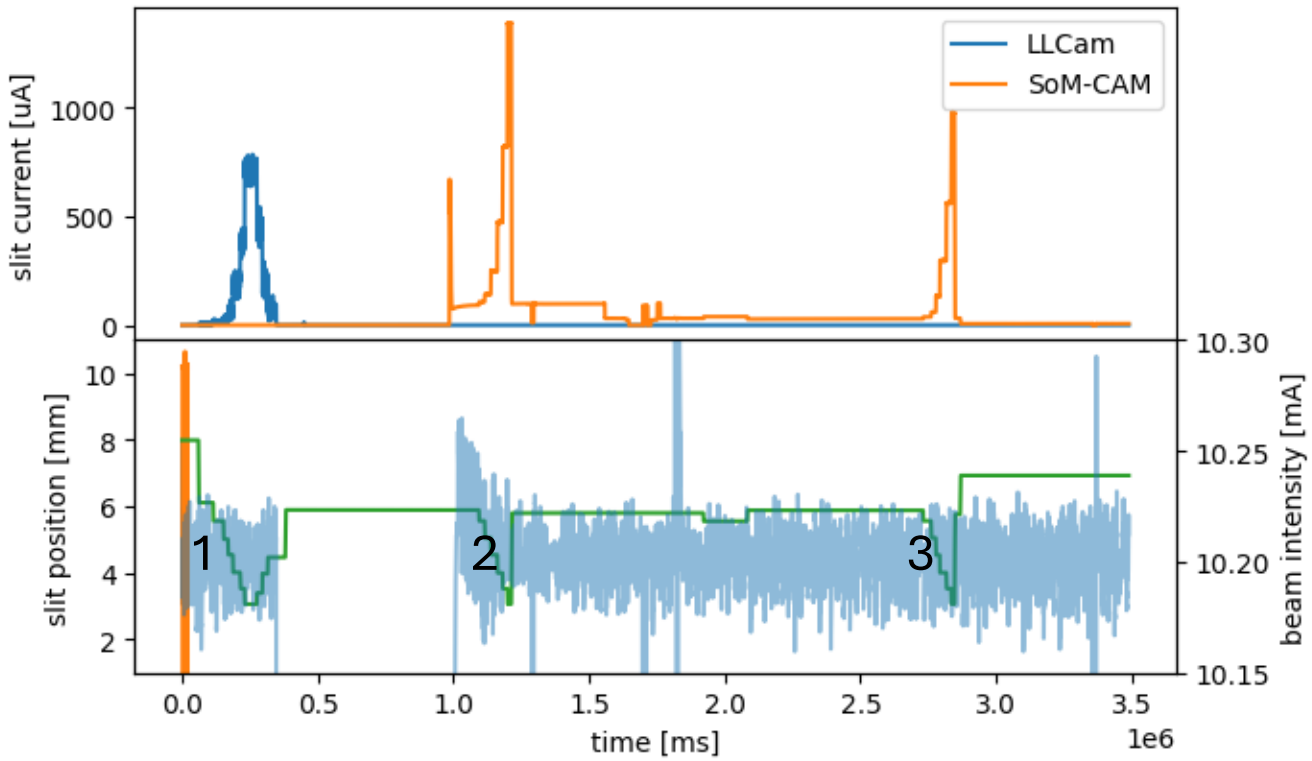
PSI

Context

1. On Thursday, 28th of November, we had a chance to do third series of SoM-CAM measurement with FW4Y slit.
2. The Beam Experiments were a bit chaotic, as everyone wanted to take as much data as possible. At the end we had very little time for this SoM-CAM test.
3. Main ideas:
   - Set FW4YU to fixed, retracted positions (minimize effect of electrons from the other slit)
   - Investigate effect of bandwidth filters, what was not done last time

FW4Y slit positions during the experiment



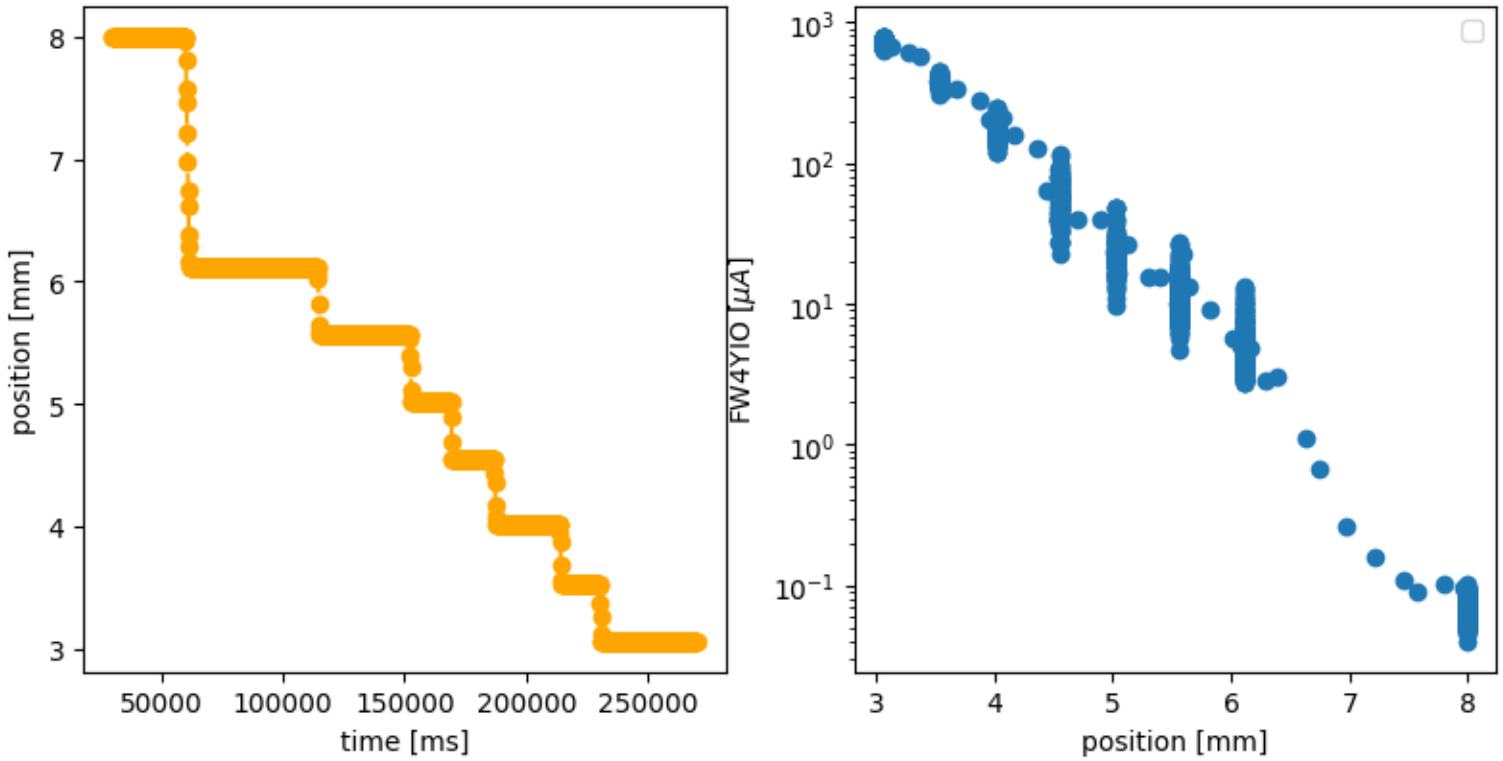
Three scans:

1. LLCam
2. SoM-CAM no Zener, no filters, no bias, grounded at rack
3. SoM-CAM, no Zener, BW0+BW1 filters bias +27 V, grounded at rack

Note a larger delay between scan 2 and scan 3: Antonio was setting up the high intensity beam at the ring and downstream.

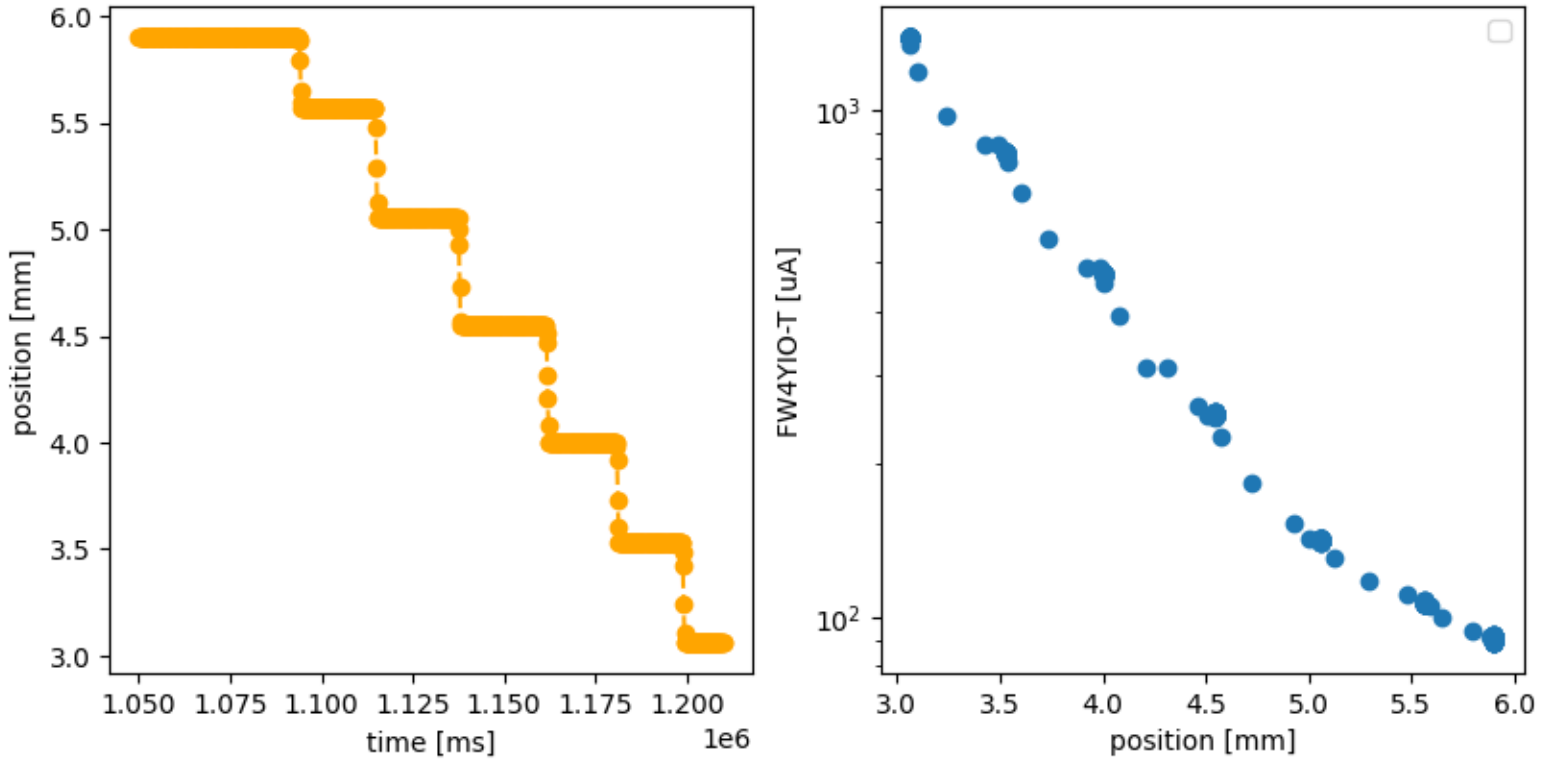
Data analysis – FW4YO, LLCam

- Scan 1: LLCam data – lots of variations in measurements at fixed points!



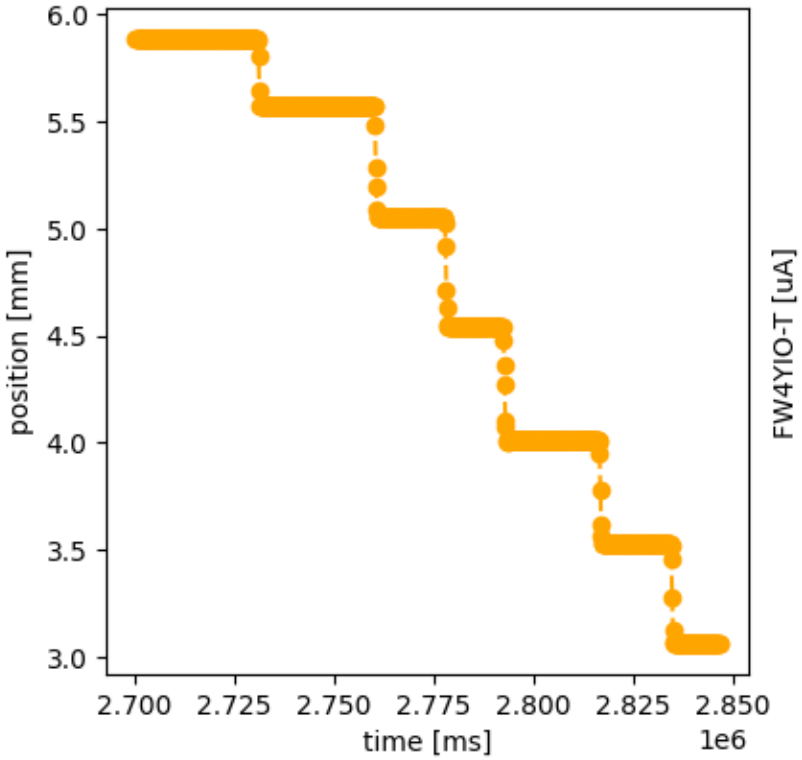
Data analysis – FW4YO, raw SoM-CAM

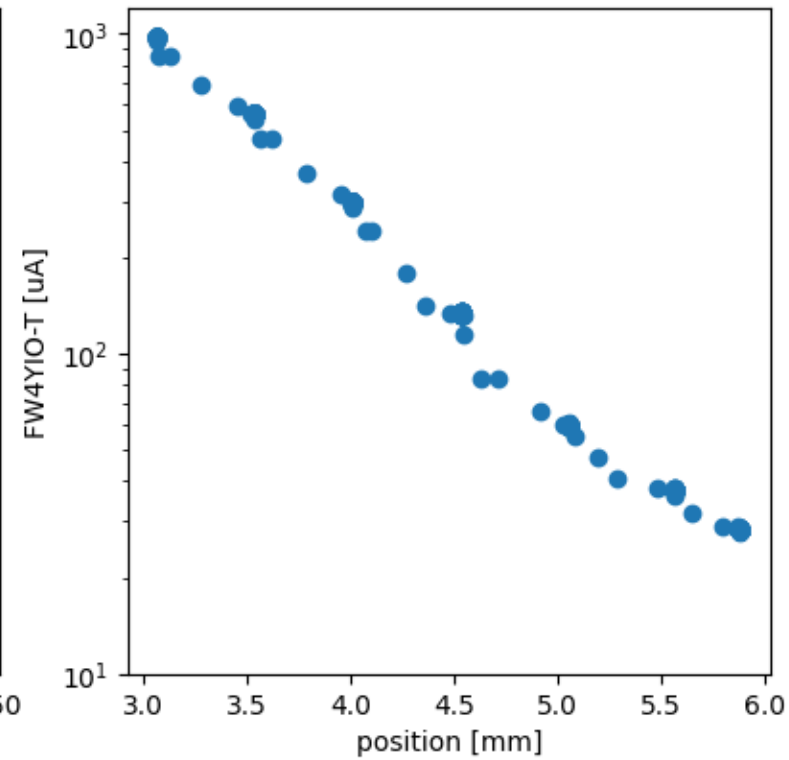
- Scan 2: SoM-CAM without Zener, without bandwidth filters, no bias, ground at rack



Data analysis – FW4YO, SoM-CAM with filters and bias

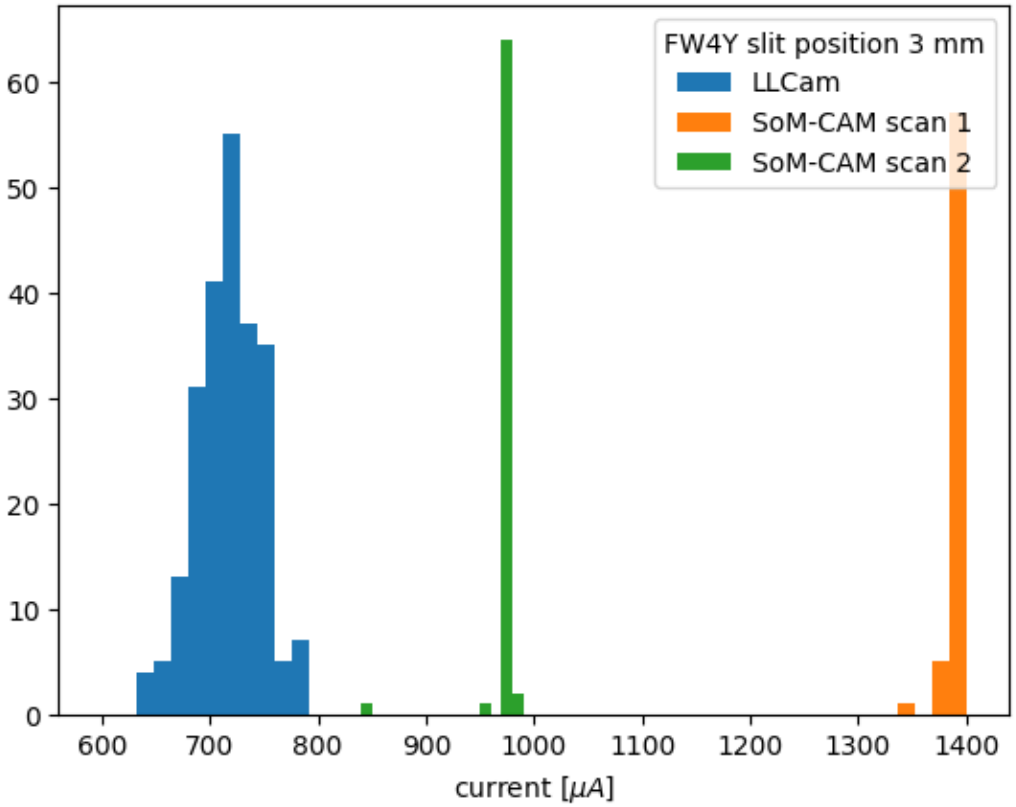
- Scan 3: SoM-CAM without Zener, with bandwidth filters (BW0+BW1), bias +27 V, ground at rack

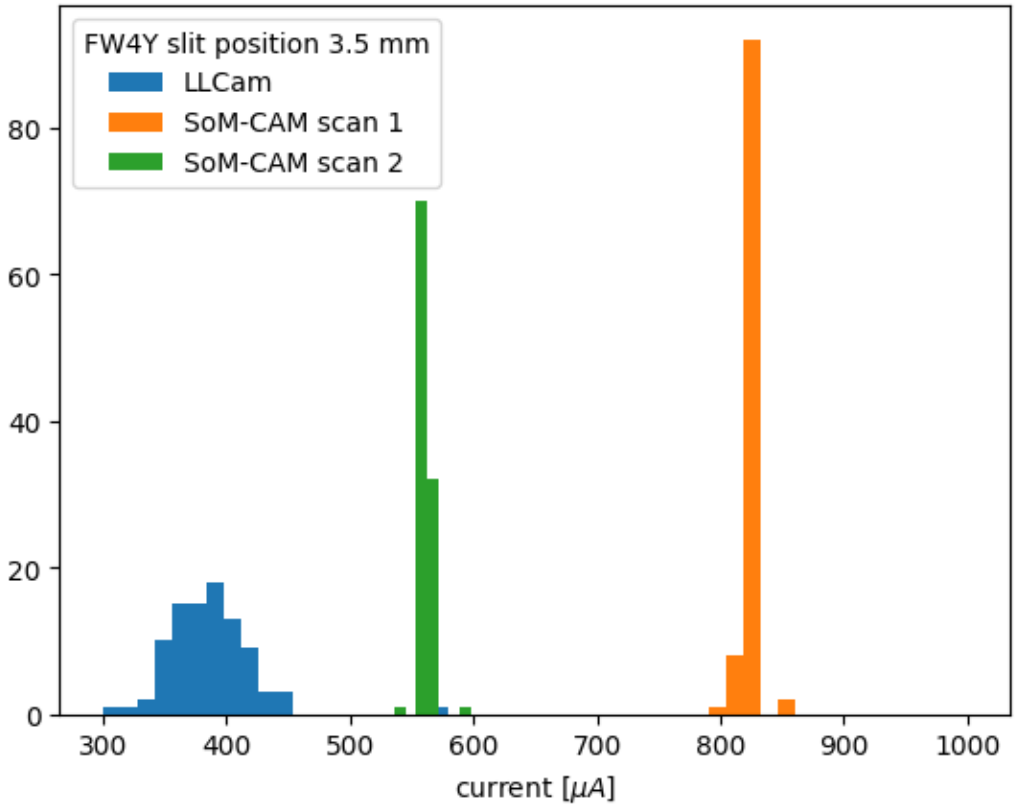




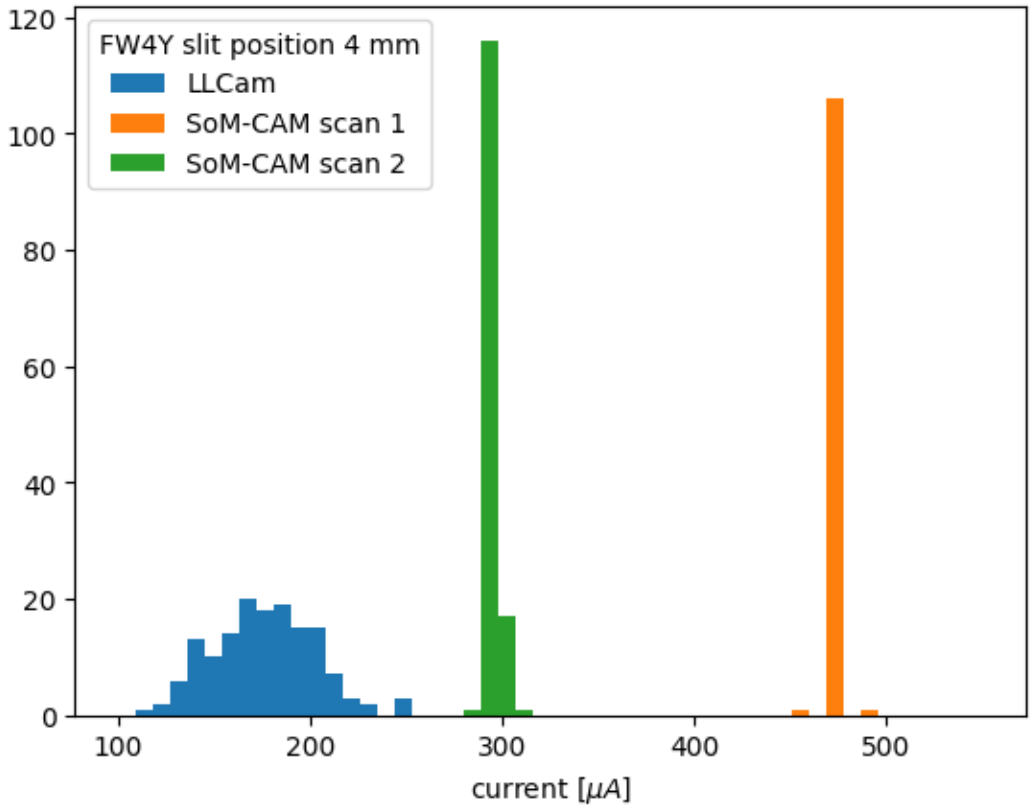
Data analysis – FW4YO slit at 3mm and 3.5 mm

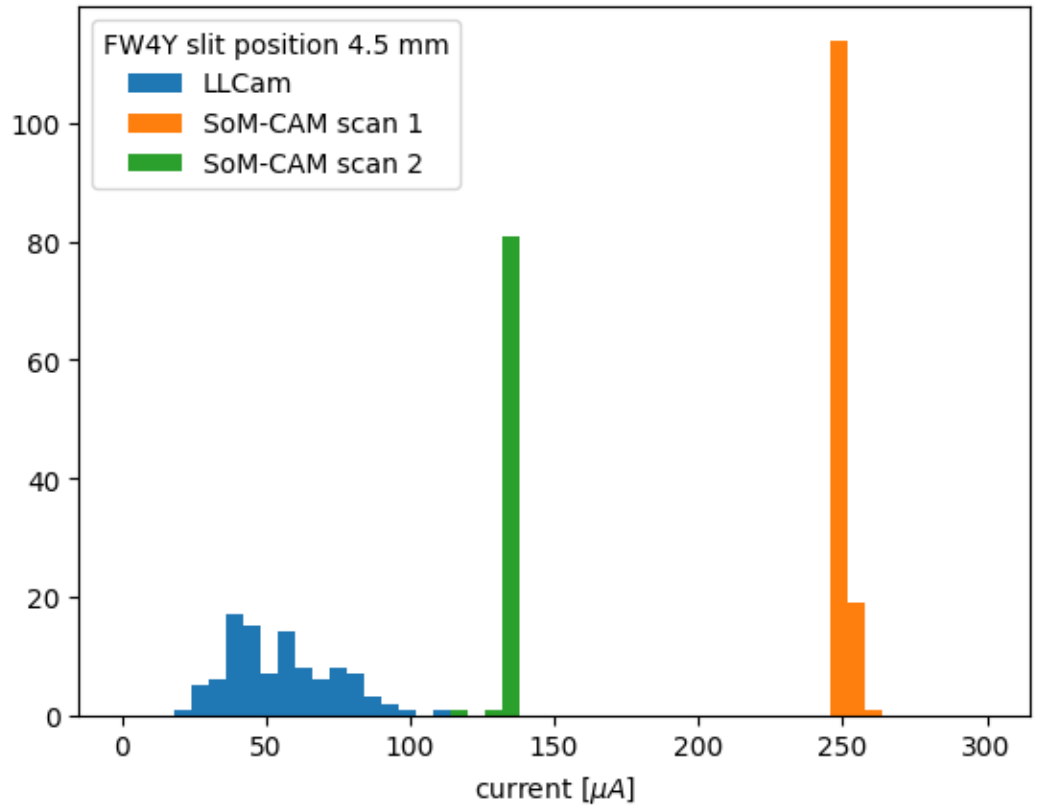
- Much less noise of SoM-CAM measurement



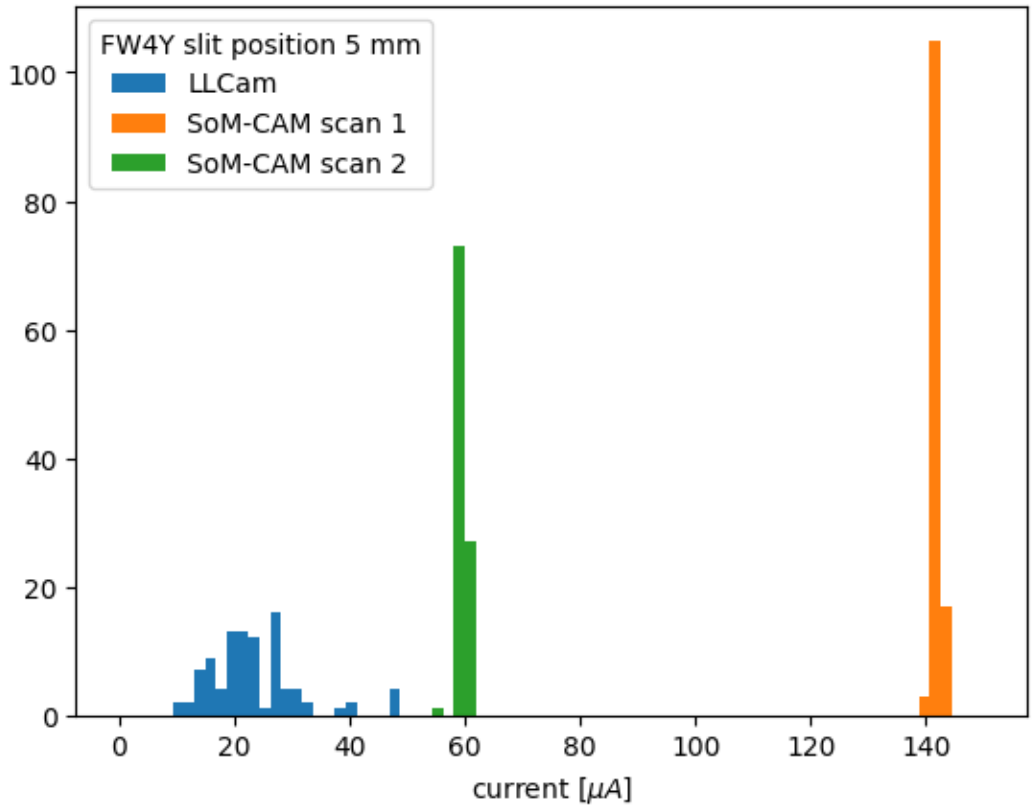


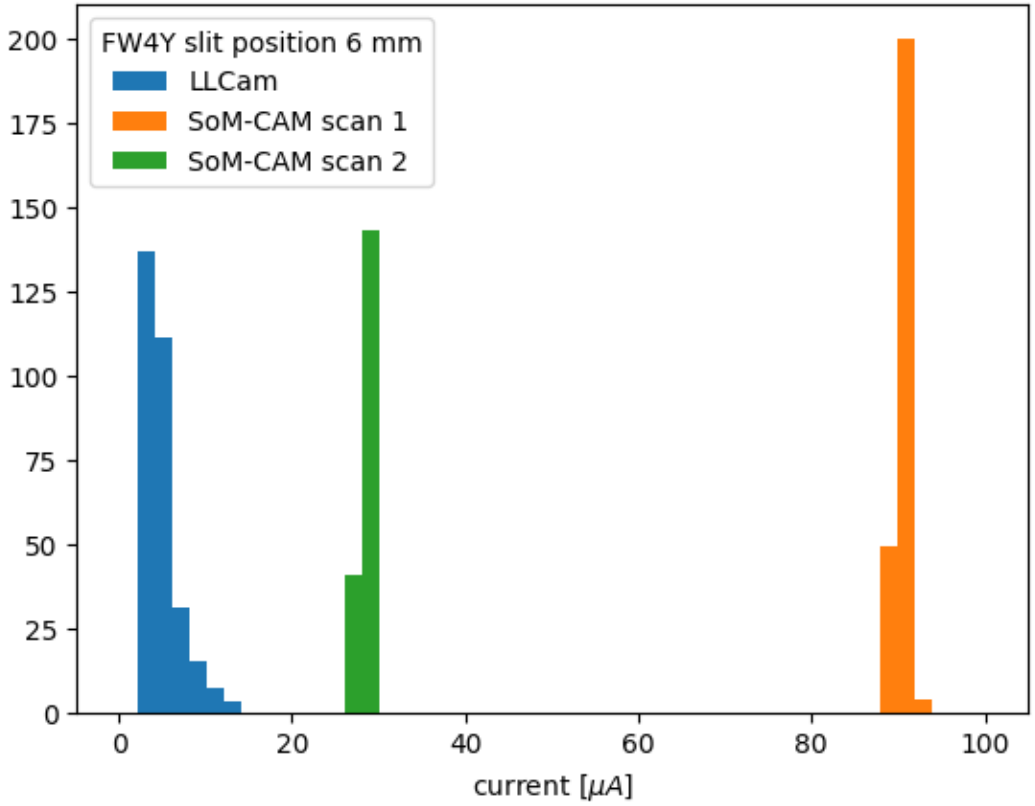
Data analysis – FW4YO slit at 4 mm and 4.5 mm



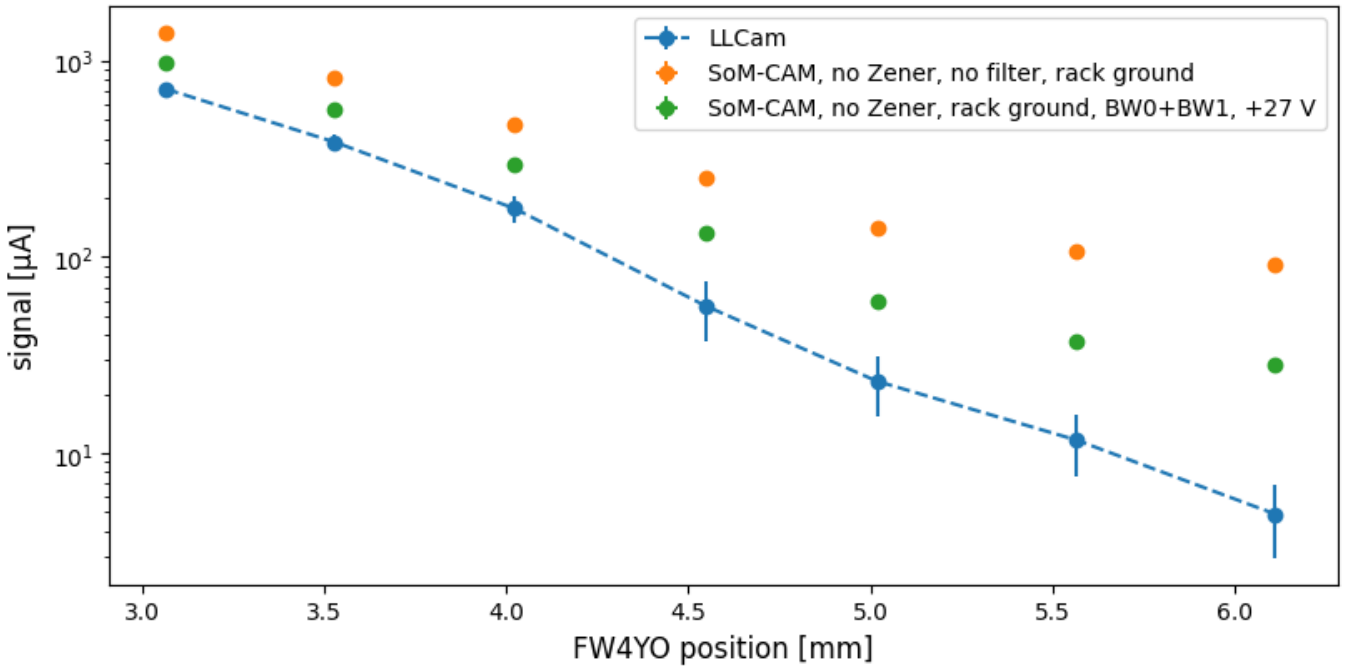


Data analysis – FW4YO slit at 5 mm and 6 mm

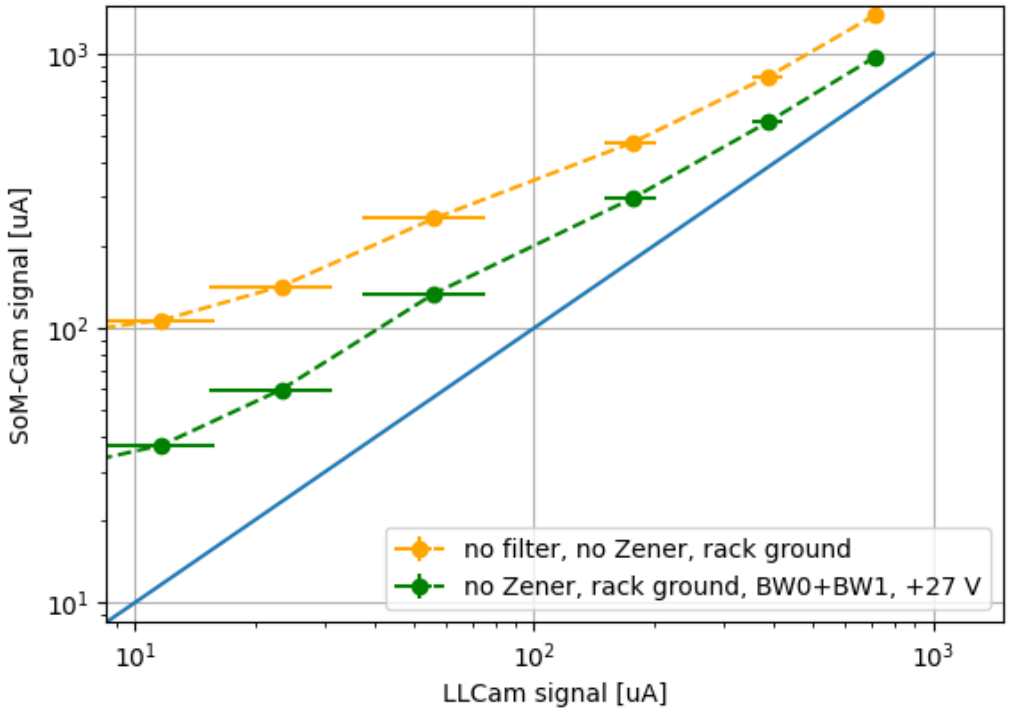




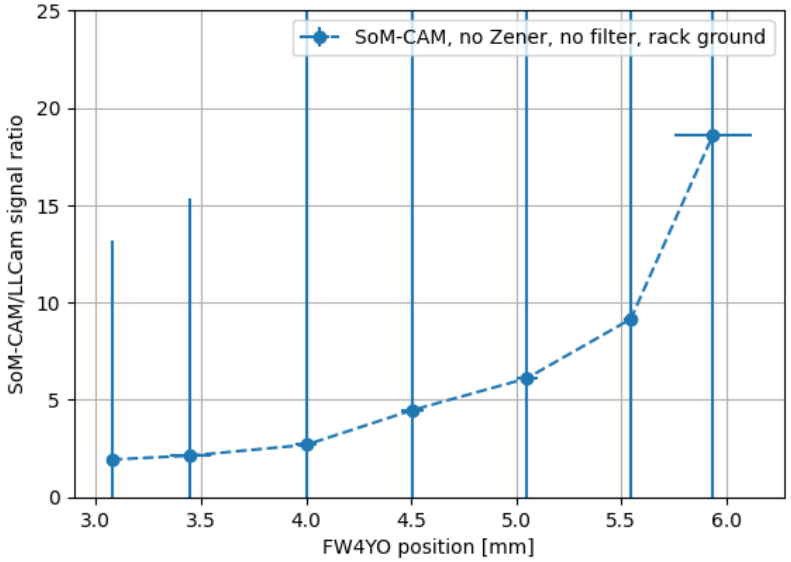
Final plots

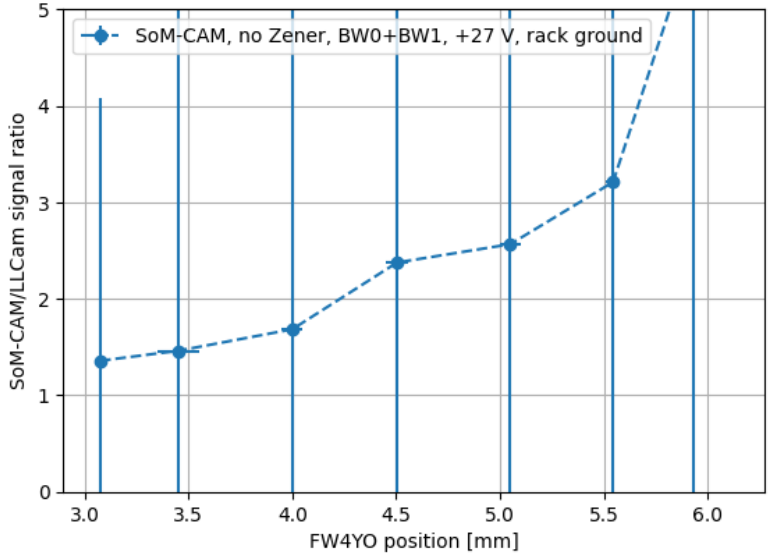


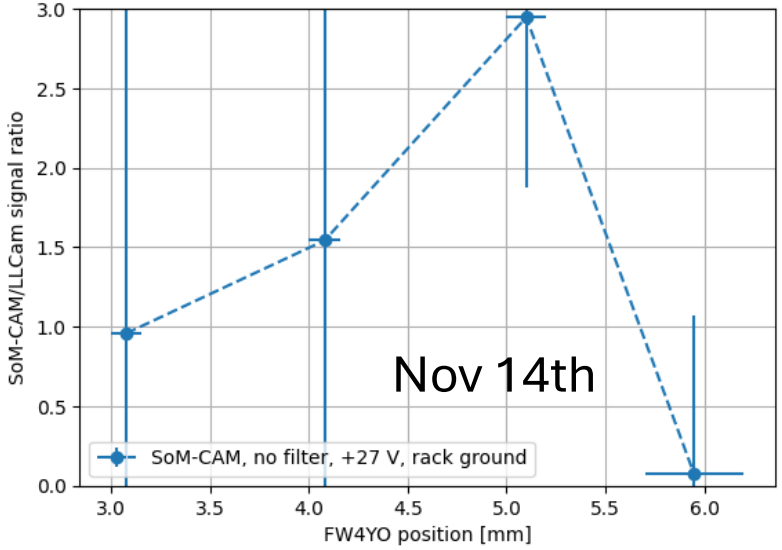
- Clearly using bandwidth filters help
- SoM-CAM still gives higher readings than LLCam



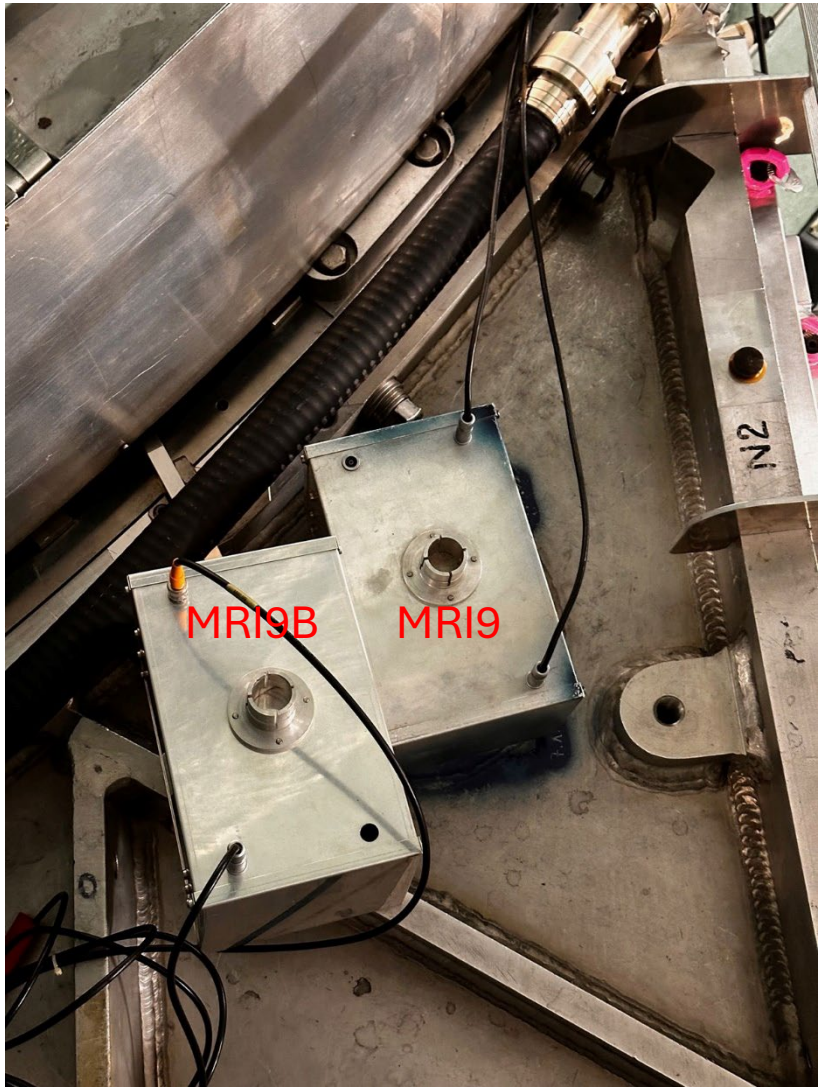
Final plots


SoM-CAM, no Zener, no filter, rack ground
SoM-CAM/LLCam signal ratio
FW4YO position [mm]

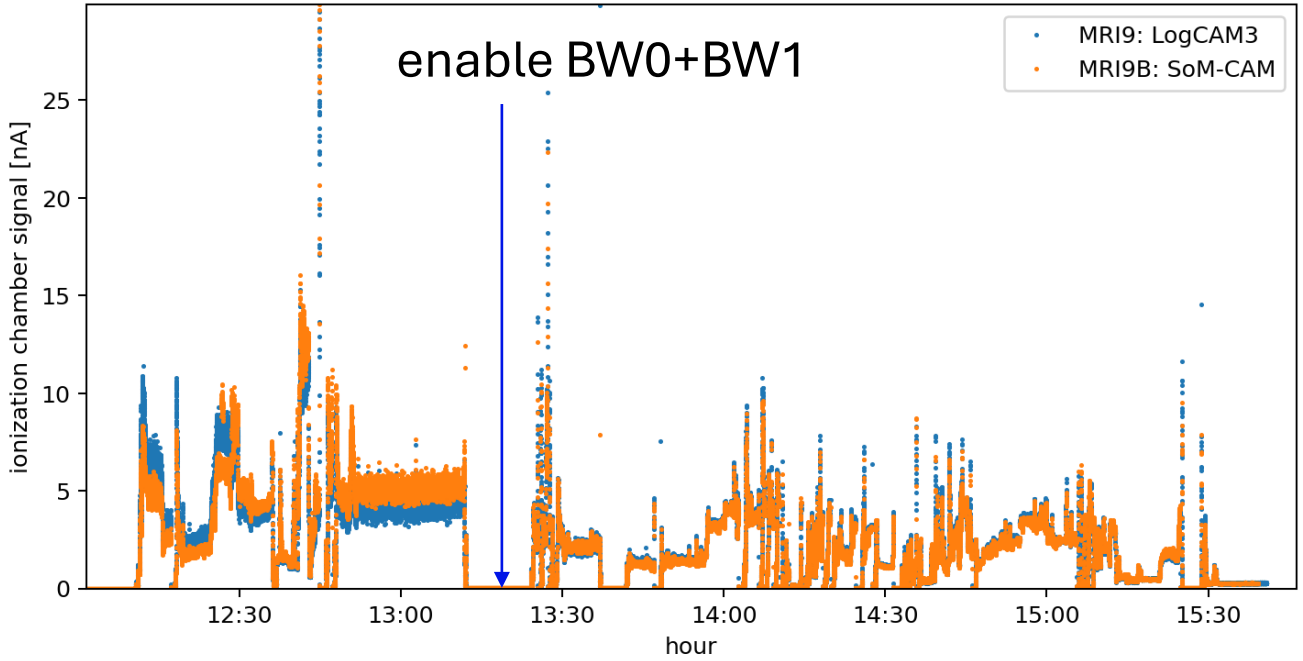

SoM-CAM, no Zener, BW0+BW1, +27 V, rack ground
SoM-CAM/LLCam signal ratio
FW4YO position [mm]


Nov 14th
SoM-CAM, no filter, +27 V, rack ground
SoM-CAM/LLCam signal ratio
FW4YO position [mm]

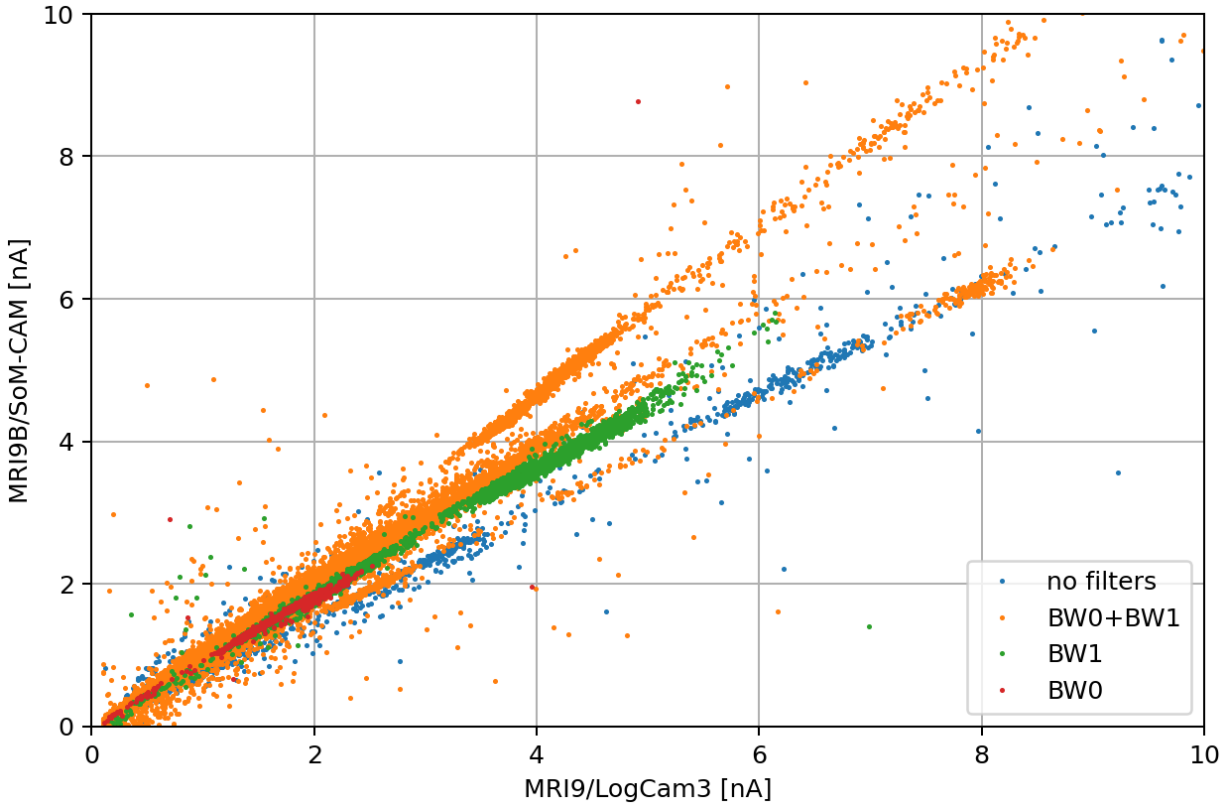
MRI9B vs MRI9



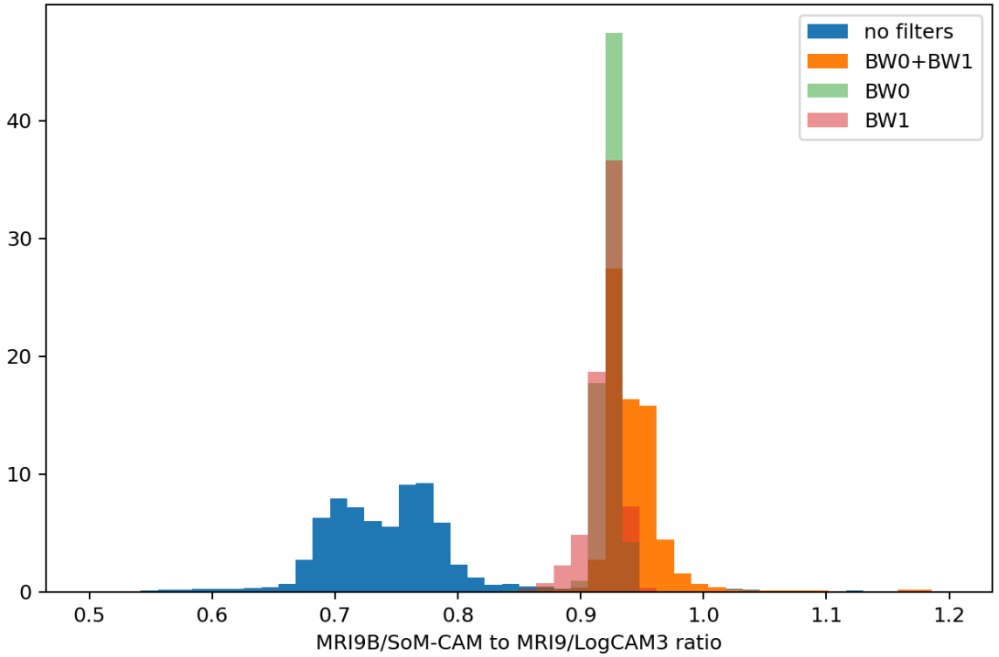
On November 28th we moved MRI9B very close to MRI9.
There are not filter boxes on these signals.
First results, from the same day:



MRI9B vs MRI9



No filters	BW0	BW1	BW0 +BW1
0.76 ±0.16	0.92 ±0.04	0.92 ±0.05	0.94 ±0.12



Summary

- Effect of bandwidth filters helps to reach better agreement with LLCam.
- The agreement is still not as good as with Zener diodes as tested on Nov 14th.
- Still should do:
  - Separate the use of the digital filters (BW0 and BW1).
  - Try filter and grounding at the detector.
  - Measure current with a precision multimeters.
  - Calorimetric test, use different channel (FW1X and FW2Y have water temperature measurement systems) or try to measure temperatures with IR camera.
- Good agreement between SoM-CAM and LogCAM3 in case of ionization chamber, when the bandwidth filters are applied.