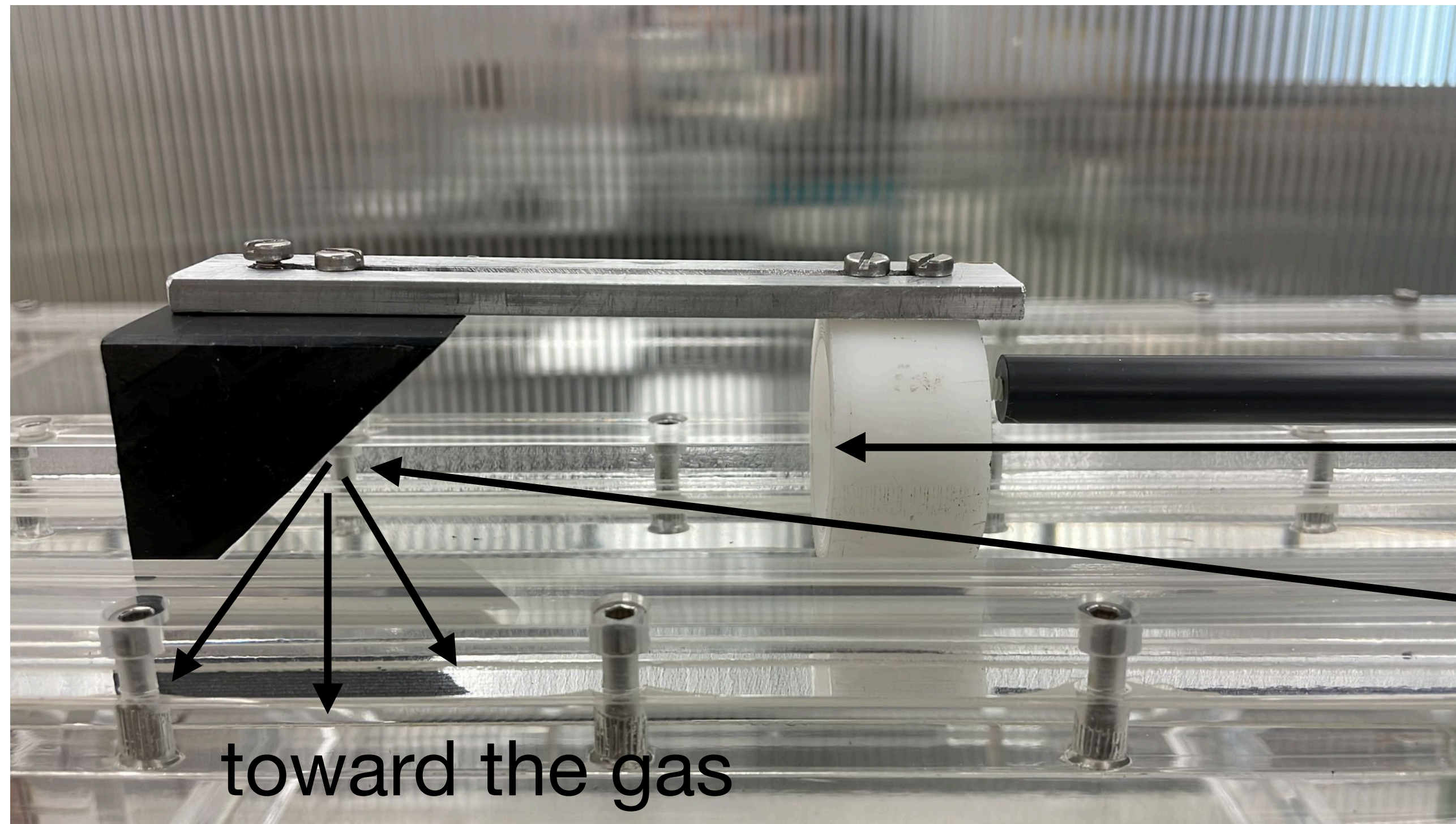


News

LIME under test: low energy x rays

Following the indications from Cristina, we are trying to produce some low energy (i.e. < 6 keV) X ray to test LIME;

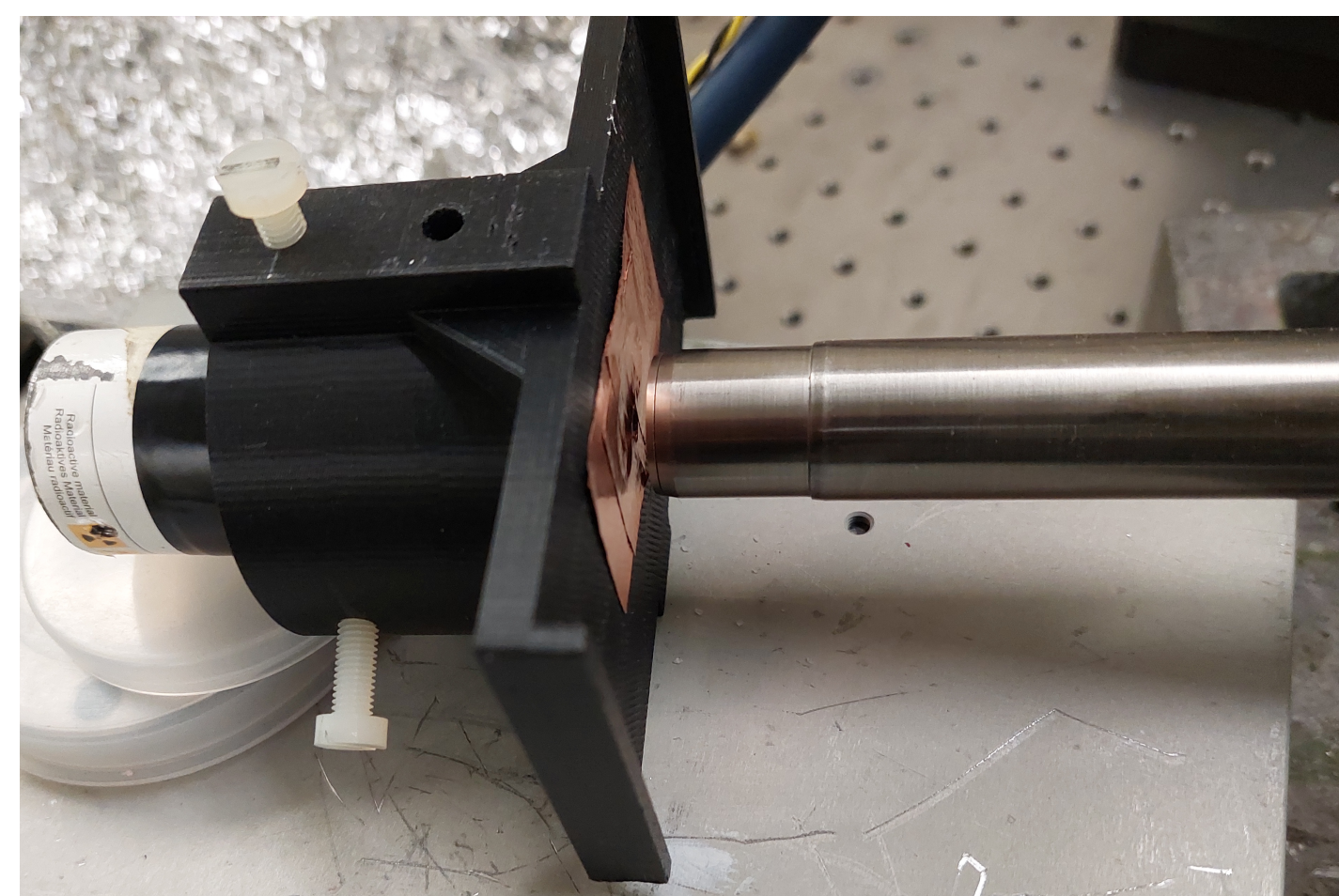
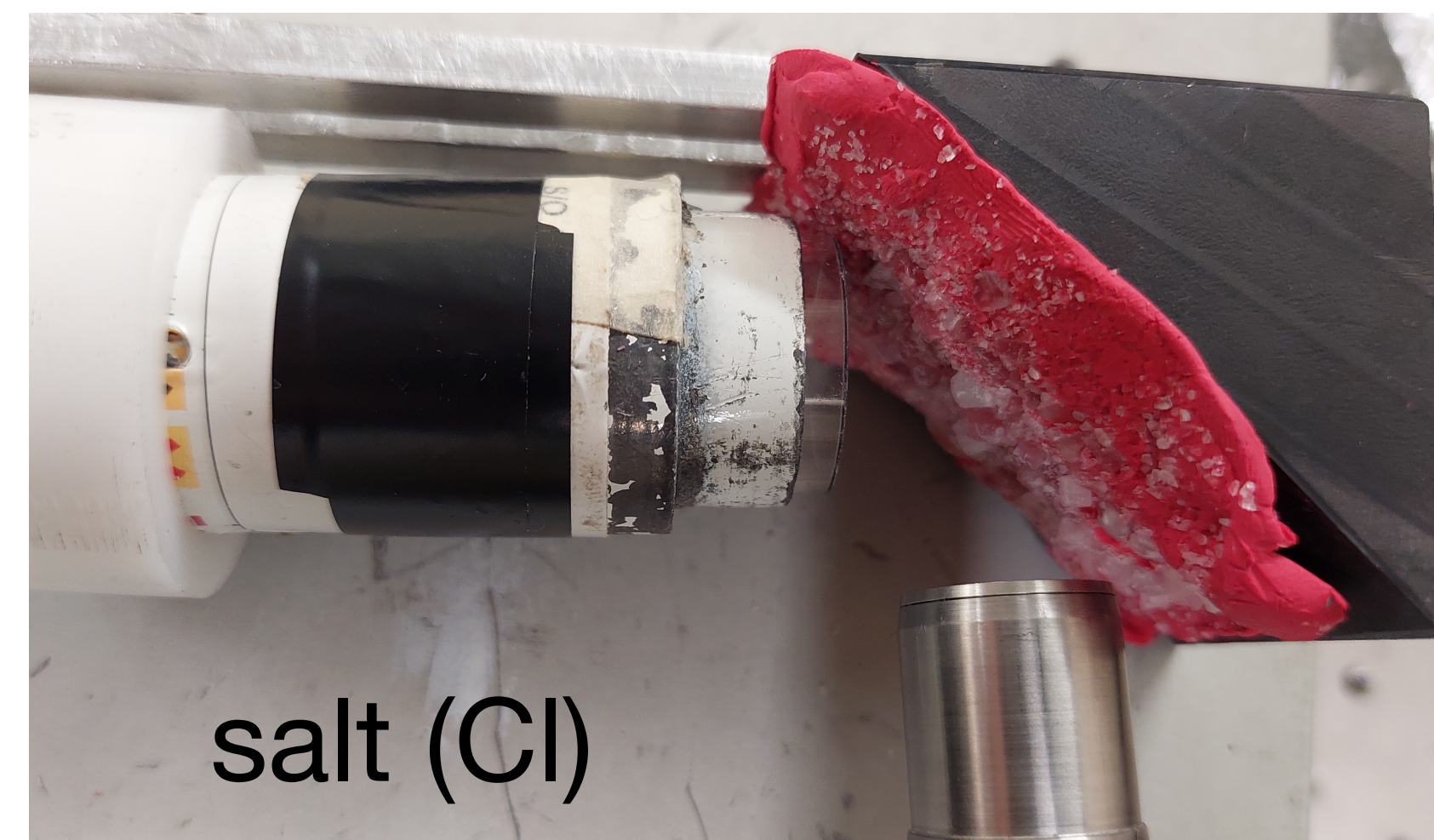
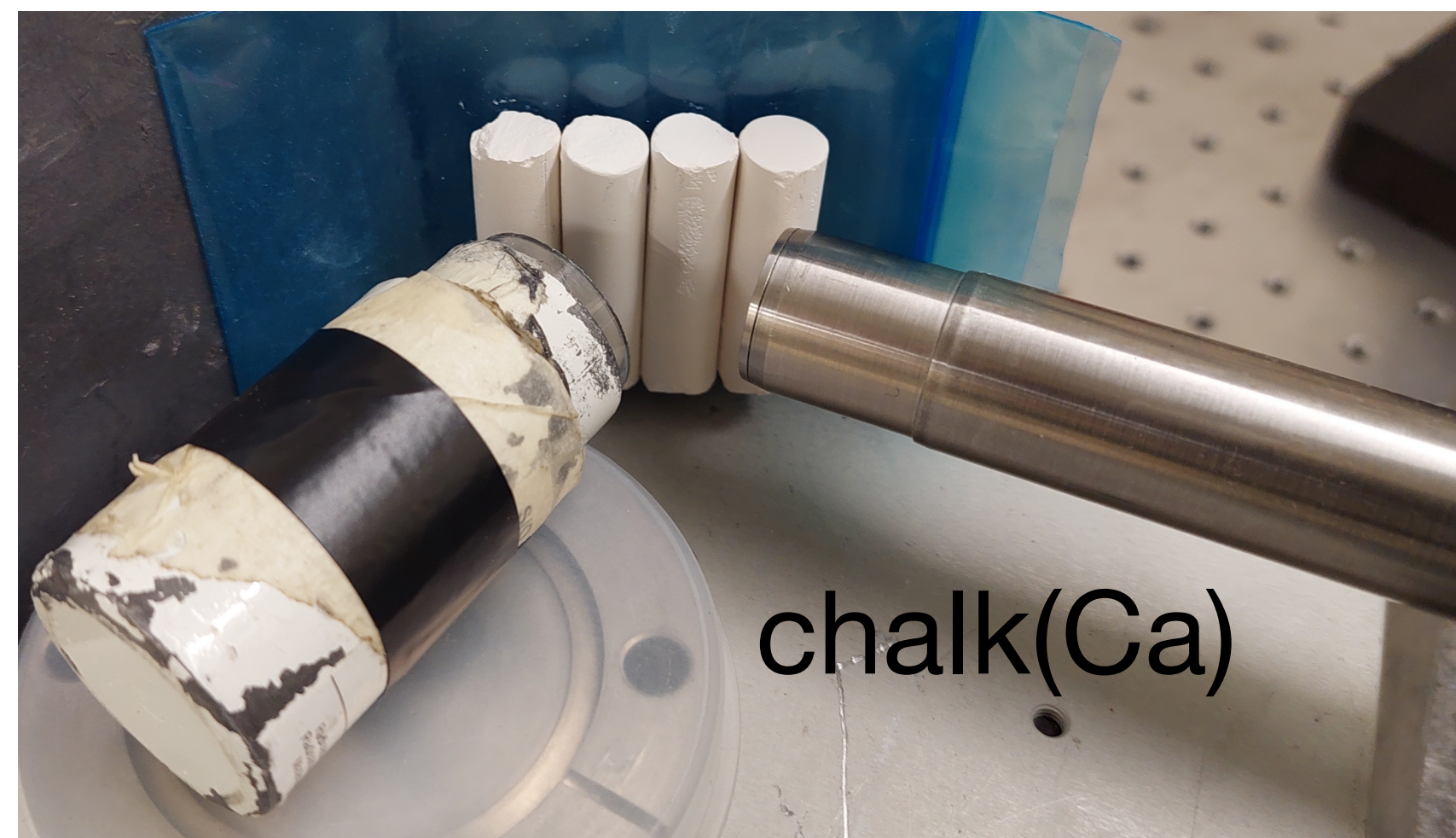
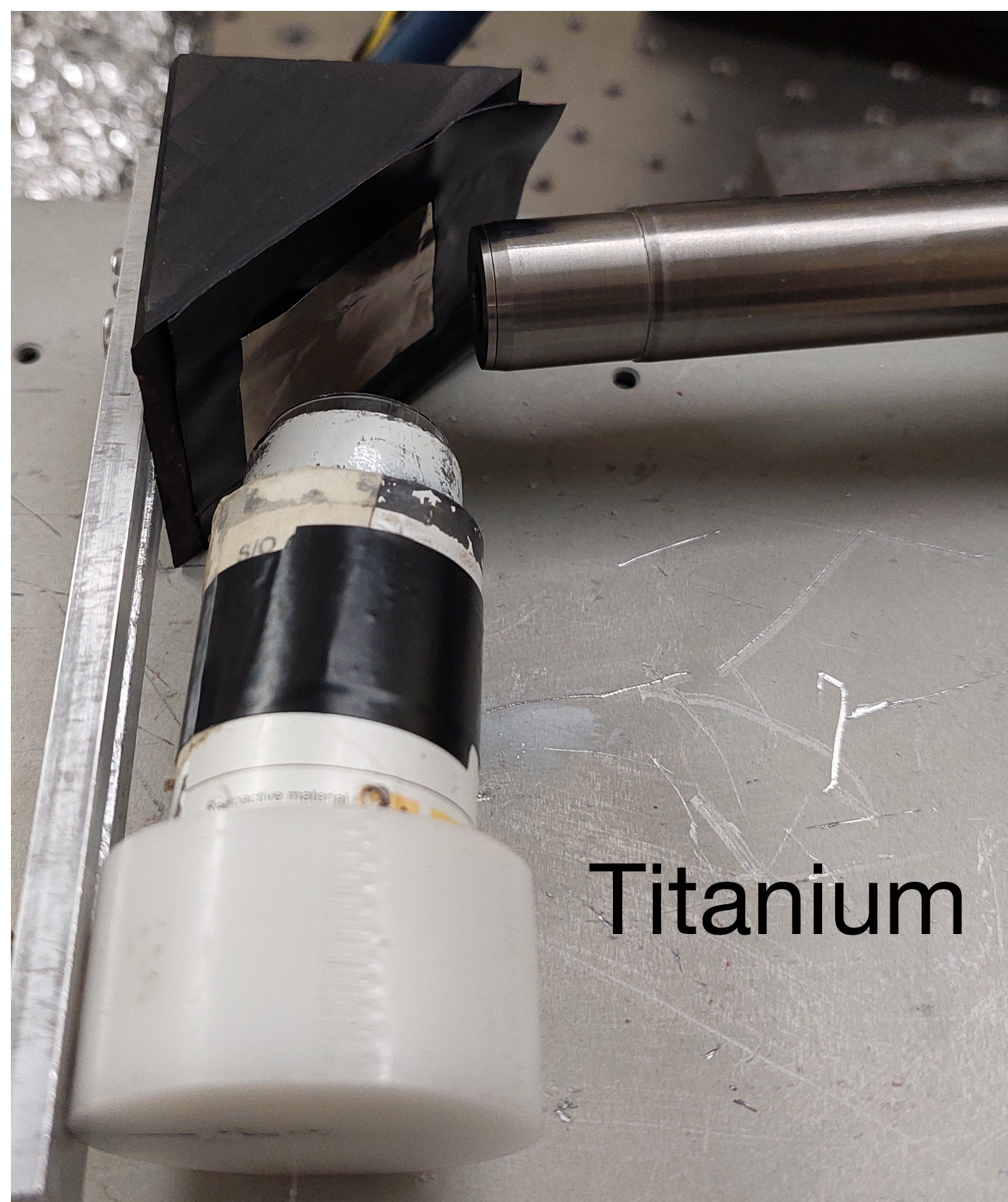


Roberto prepared a trolley able house the 740 MBq ^{55}Fe source to irradiate a target

toward the gas

LIME under test: low energy x rays

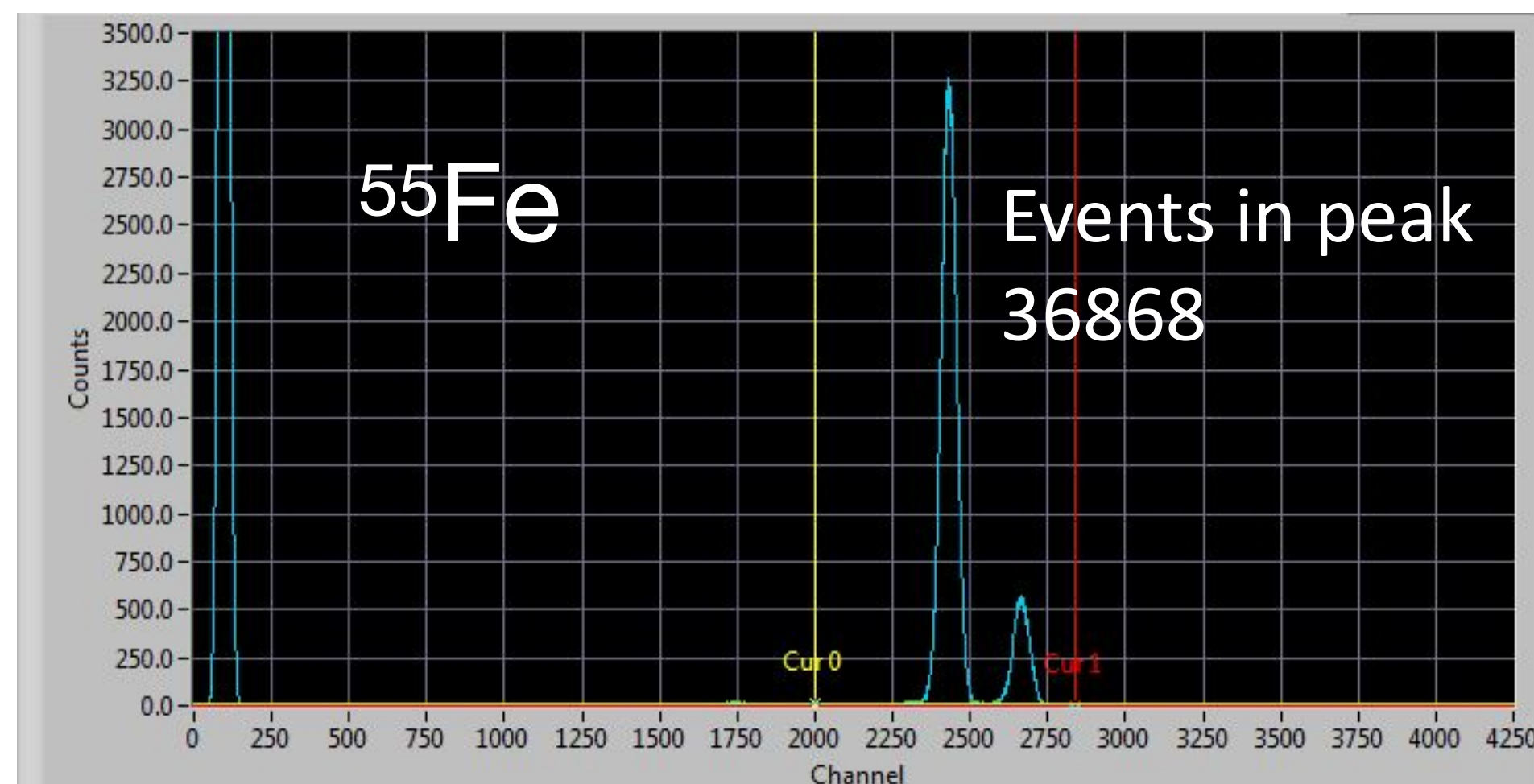
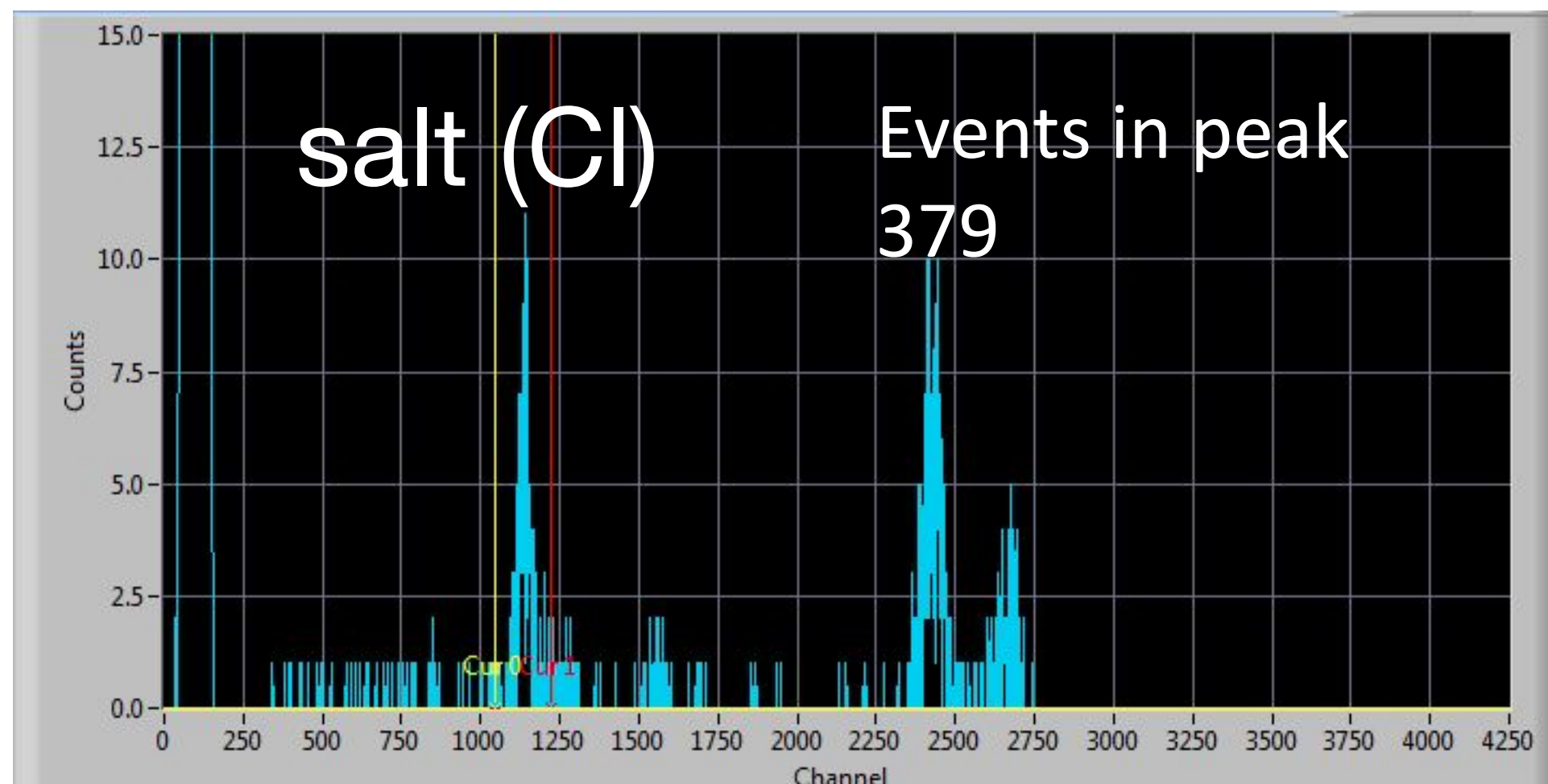
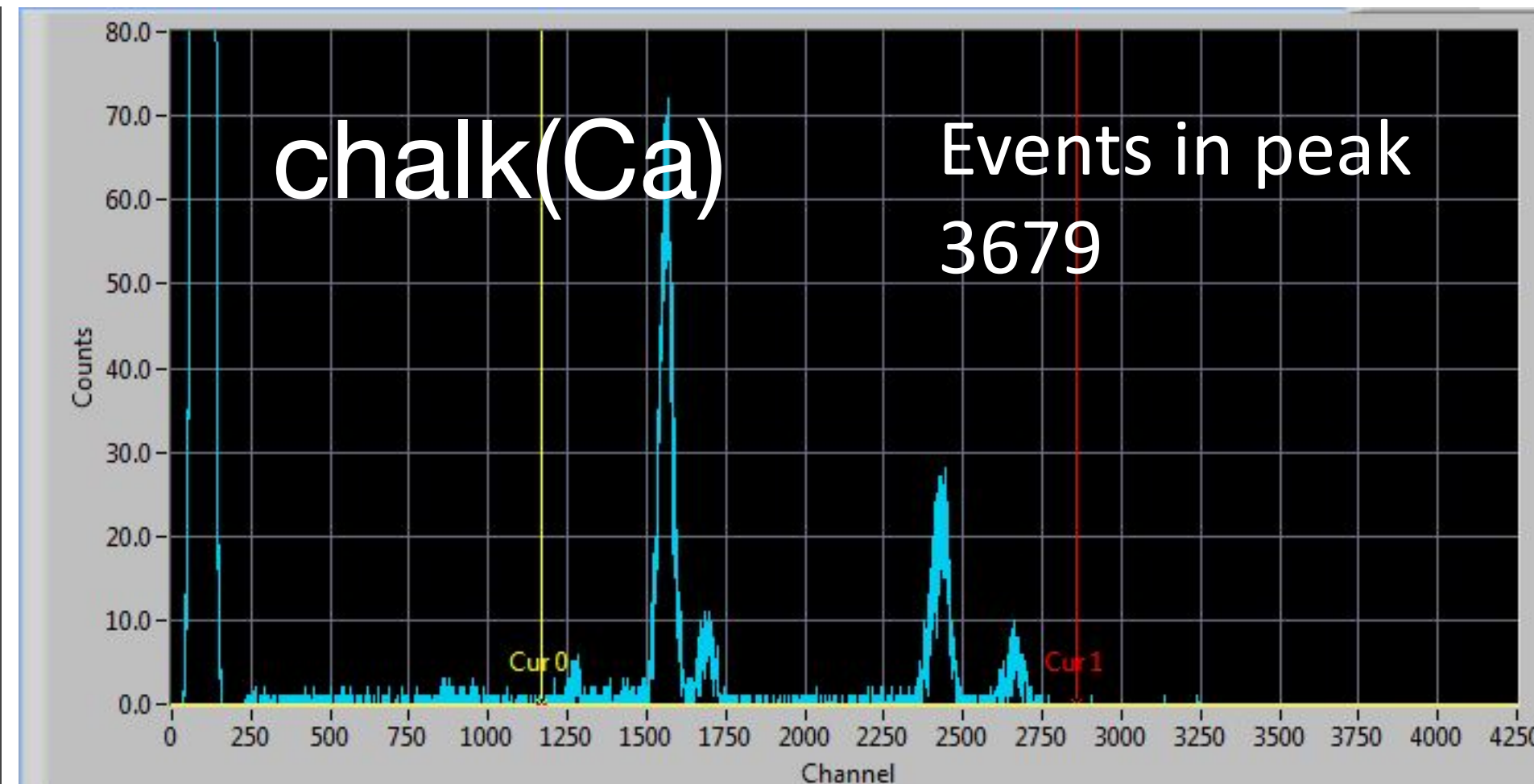
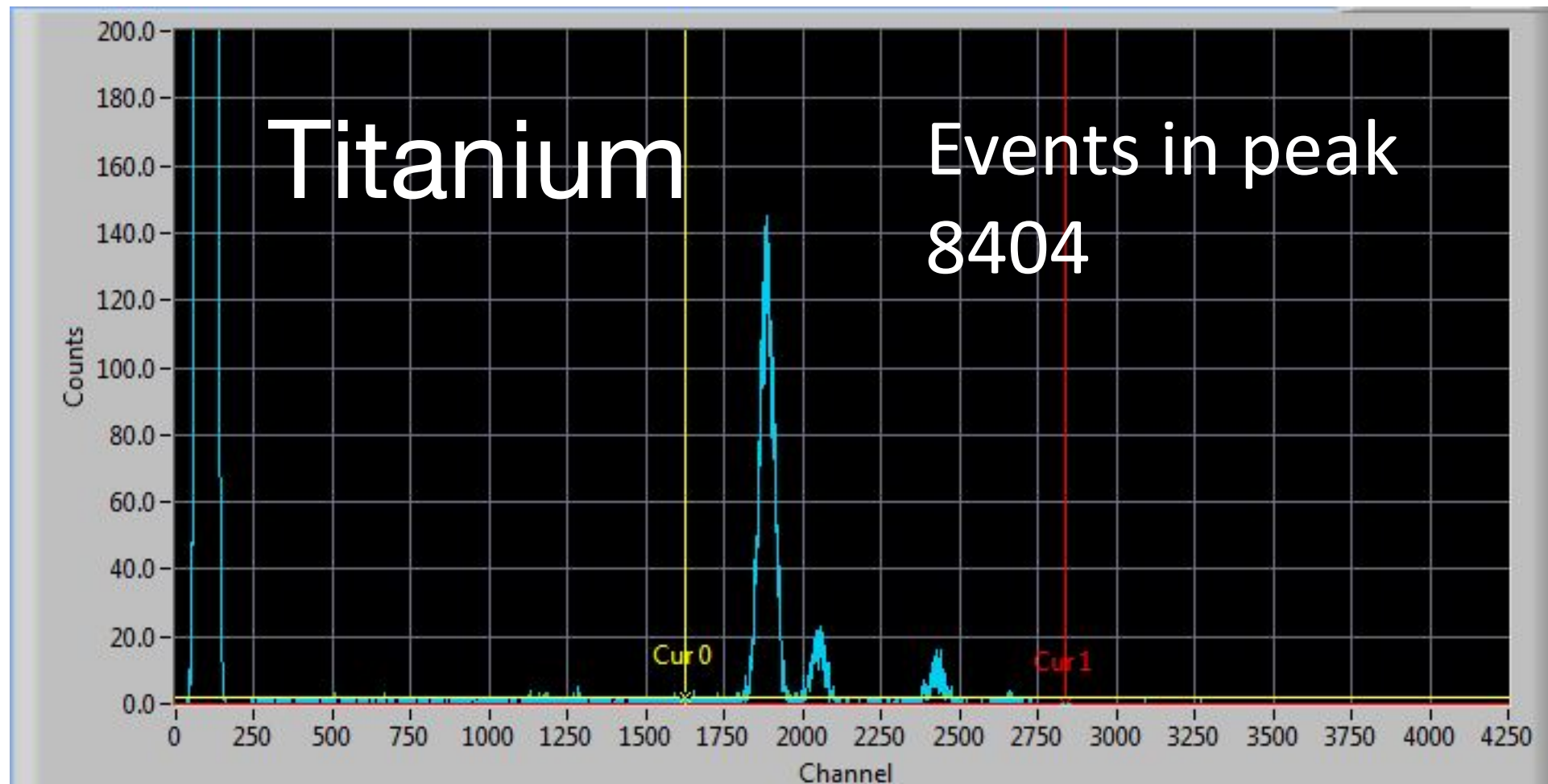
Thanks to a SDD in Dafne-Luce facility at Frascati Lab, we tested the effectiveness of our very rough setup



^{55}Fe with the collimator we usually use

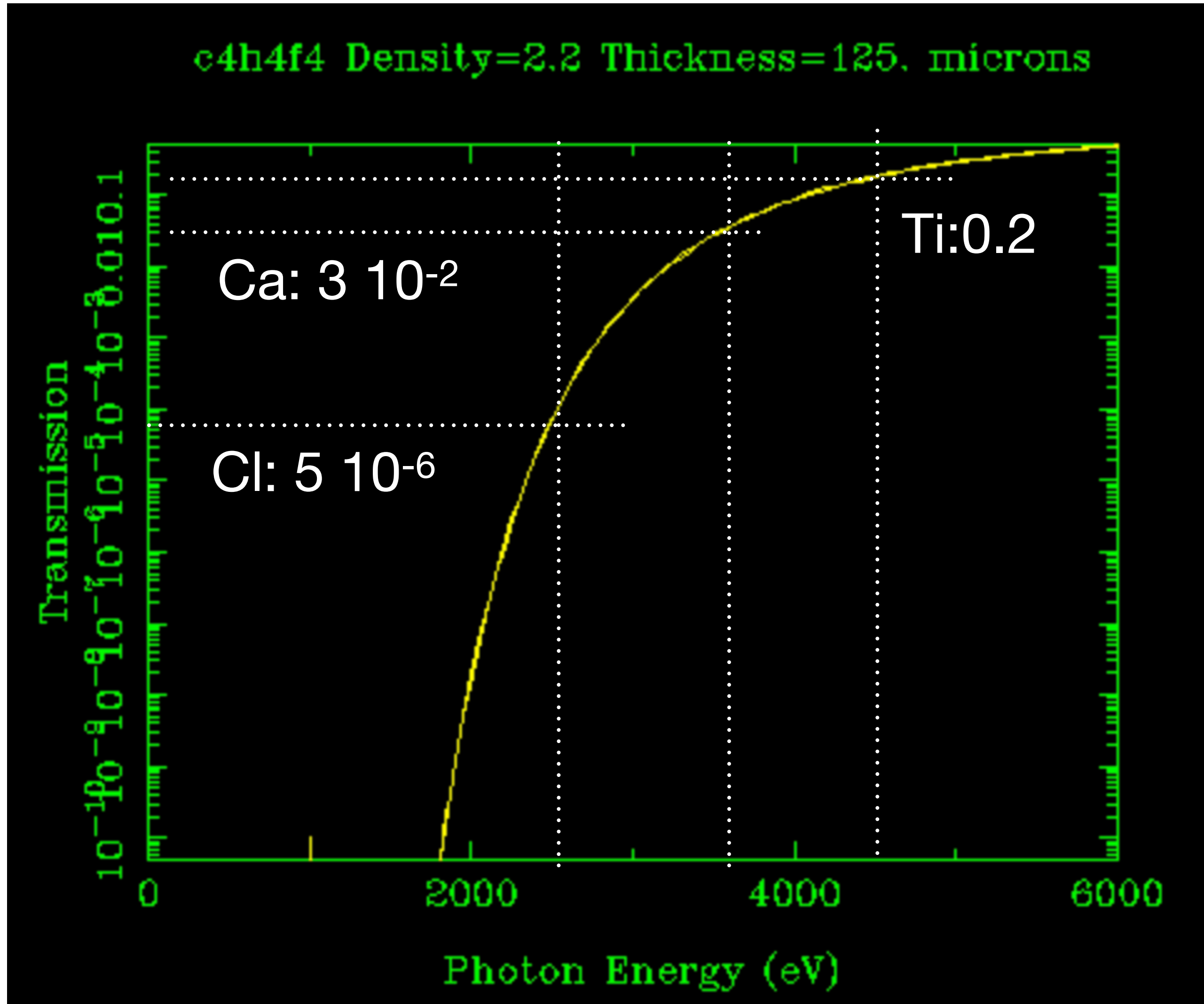
LIME under test: low energy x rays

It was possible to evaluate the relative yields



Ti = 23% ^{55}Fe
Ca = 10% ^{55}Fe
Cl = 1% ^{55}Fe

LIME under test: low energy x rays



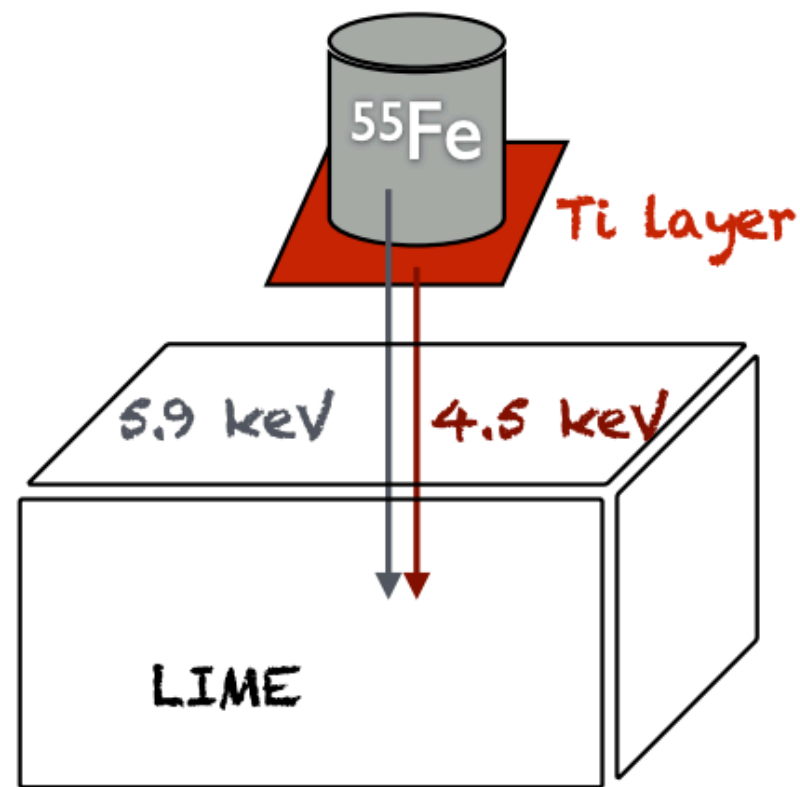
Once multiplied by the very different probability of entering the 125 μm window:

- Ti: reasonable;
- Ca: possible;
- Cl: hopeless;

Elemento	Energia do raio X (keV)
Si $K_{\alpha,\beta}$	1,74
S $K_{\alpha,\beta}$	2,31
Cl $K_{\alpha,\beta}$	2,62
K K_{α}	3,31
Ca K_{α}	3,69
Ti K_{α}	4,51

Titanium: another point in the linearity plot

Prior to that, we took some data with Ti (the one with the lowest absorption probability from air and teflon window) in "penetration" mode:



Expect to see inside LIME:

- the fraction of 5.9 keV X-rays not absorbed by Ti and teflon window
- a (smaller) fraction of 4.5 keV X-rays not absorbed by teflon window

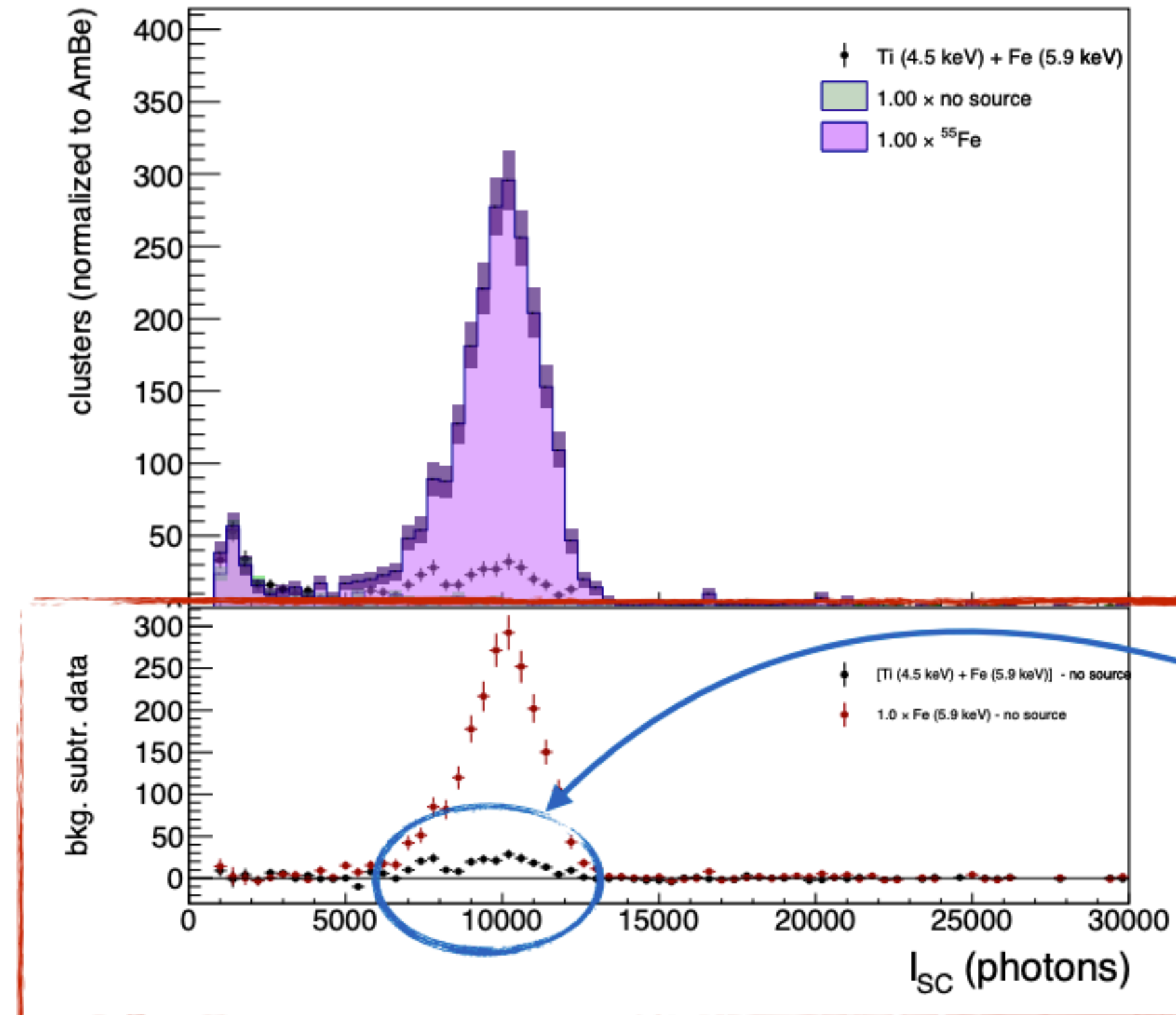
i.e. a double peak

Emanuele analysed a first sample of data taken with Titanium in penetration mode (instead of reflection)

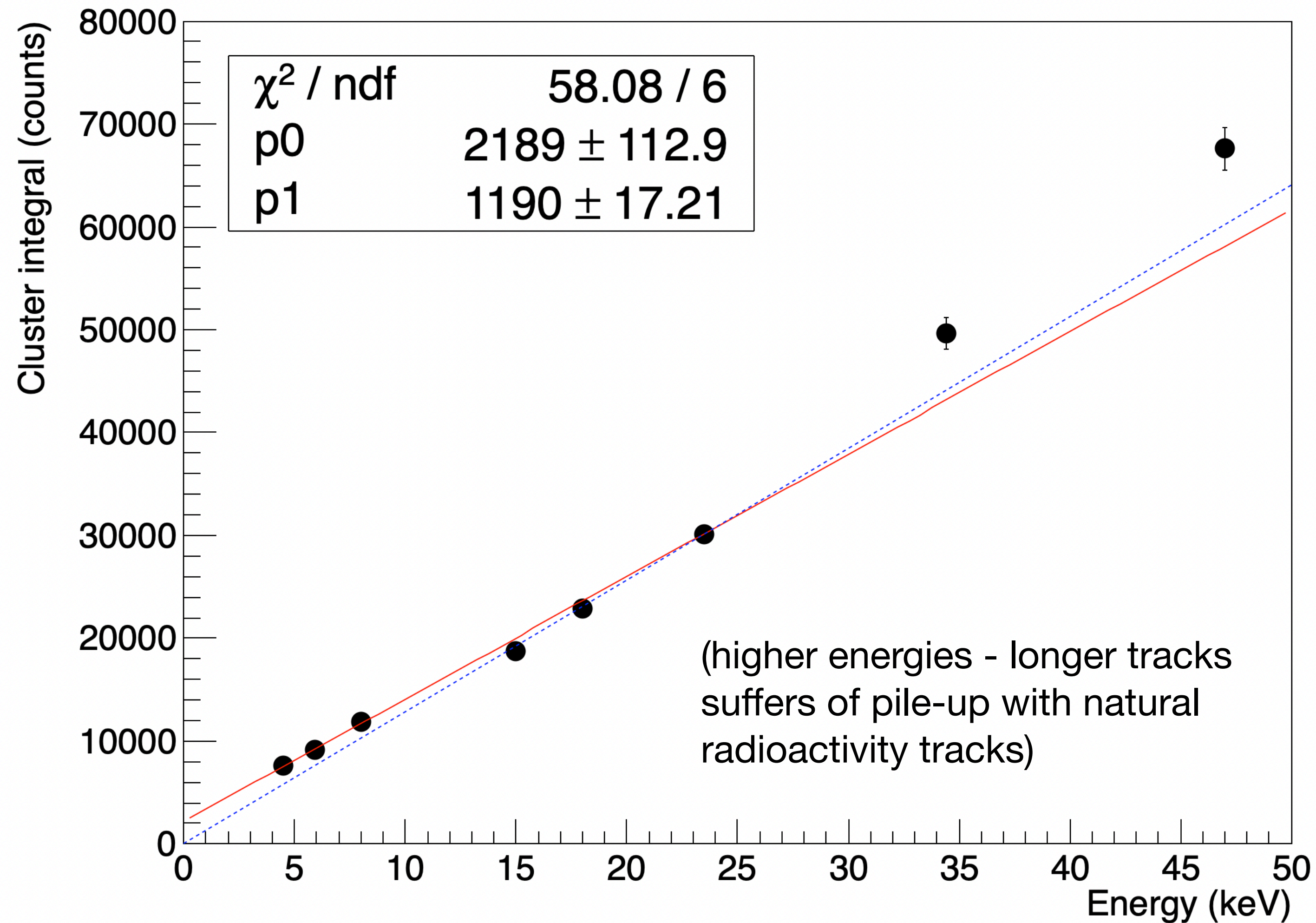
Data after selection



As usual compare data with Fe-only, Fe+Ti, bkg-only. Subtract bkg-only normalized to exposure time.

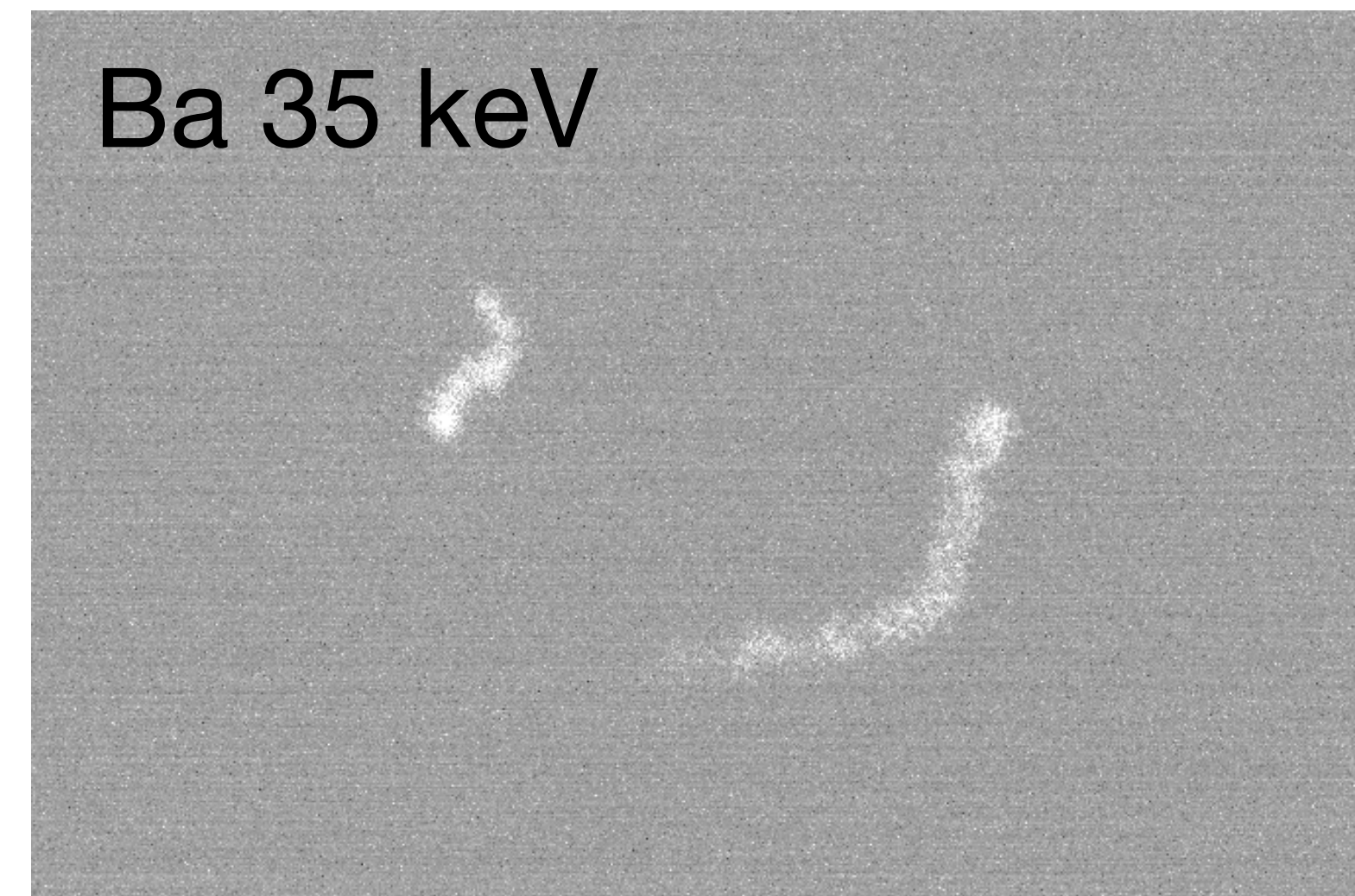
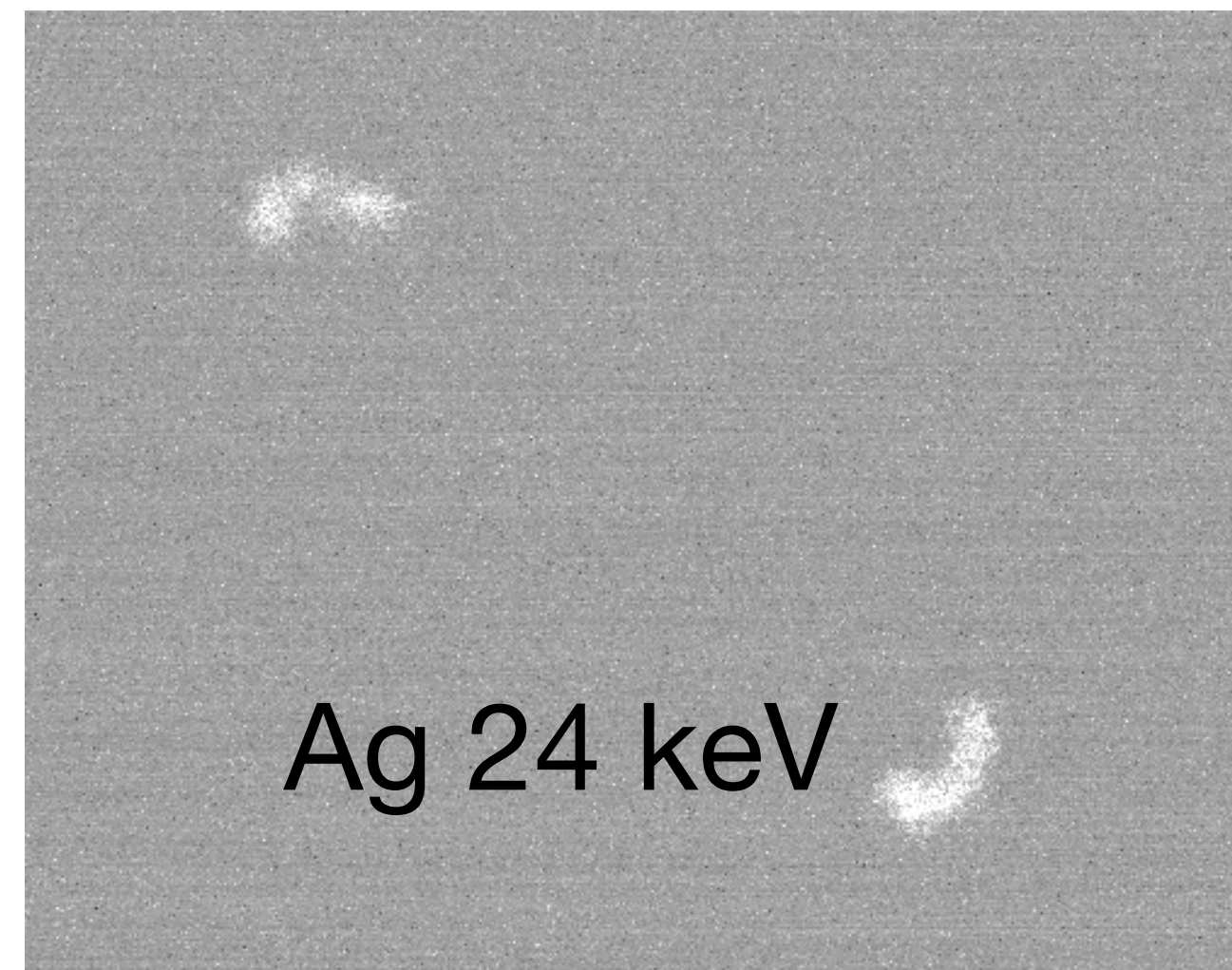
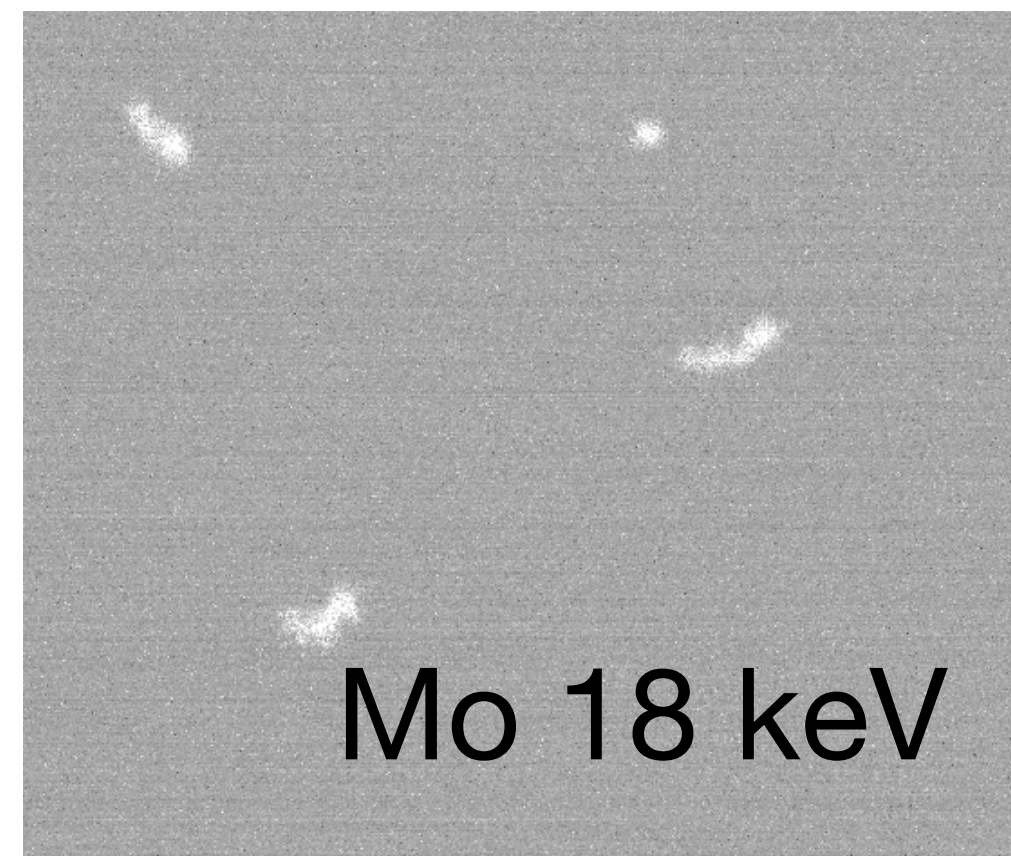
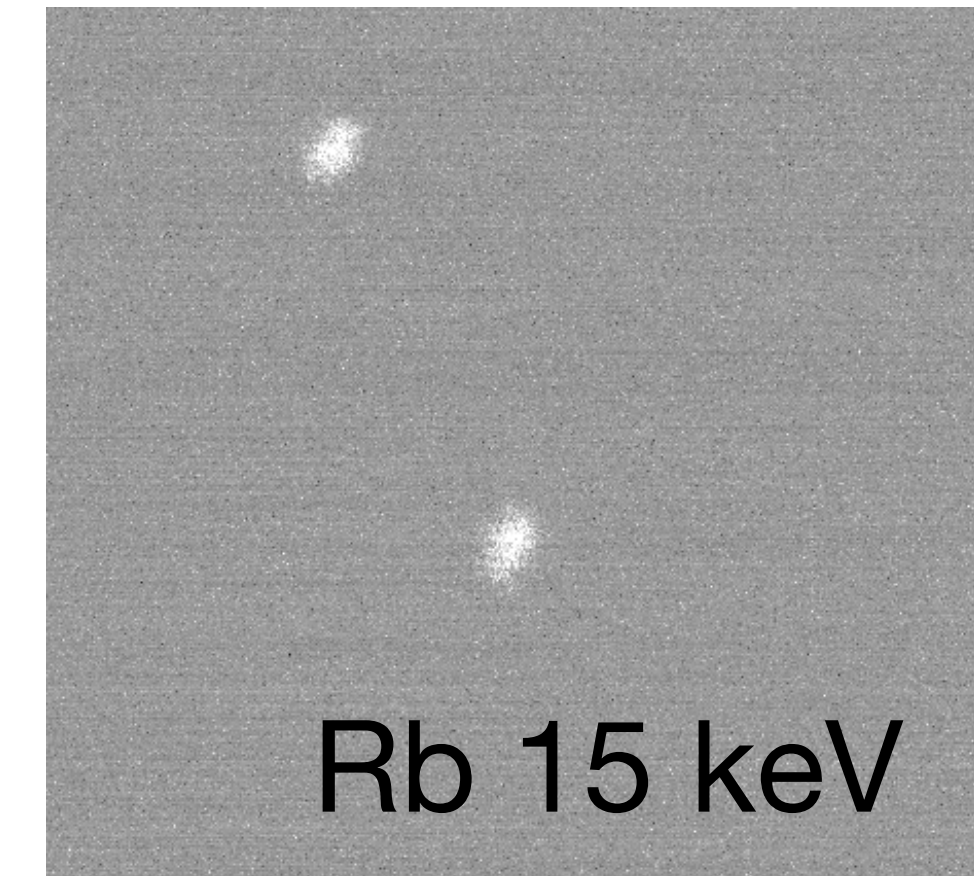
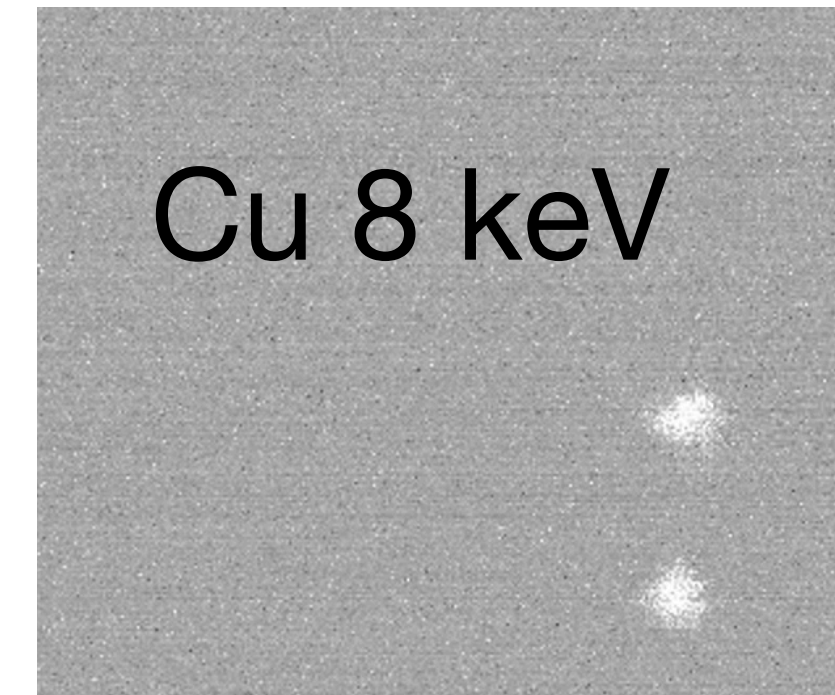
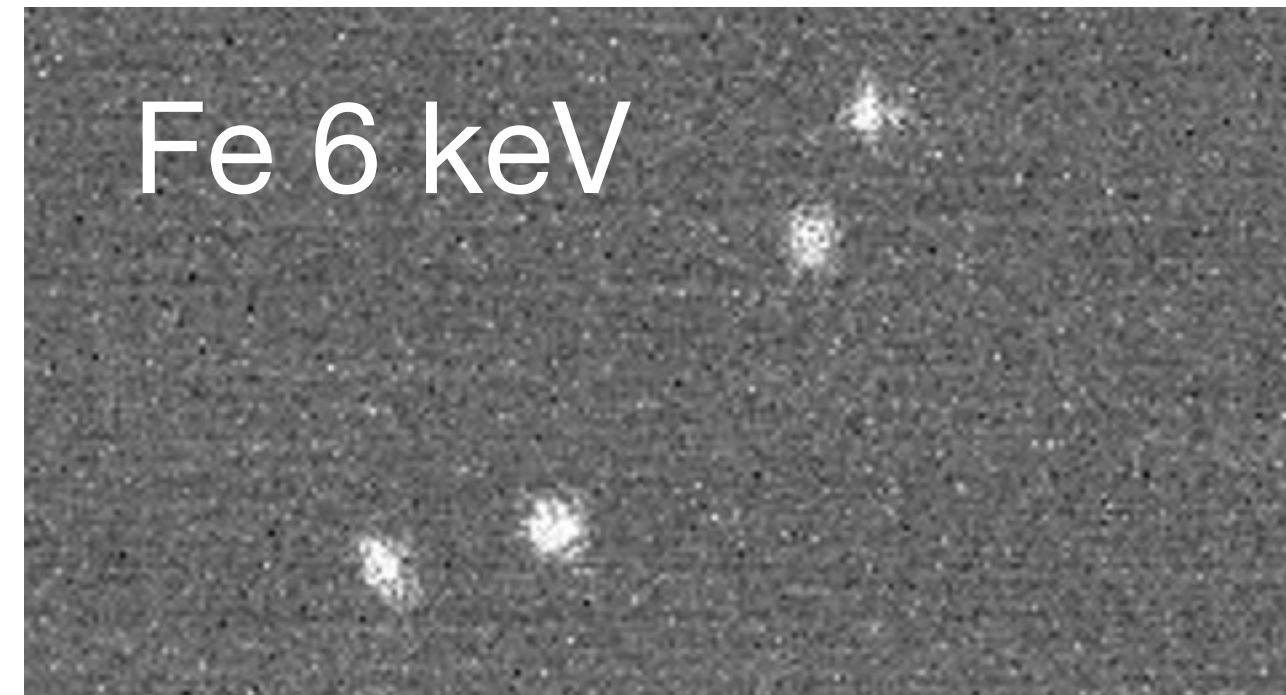
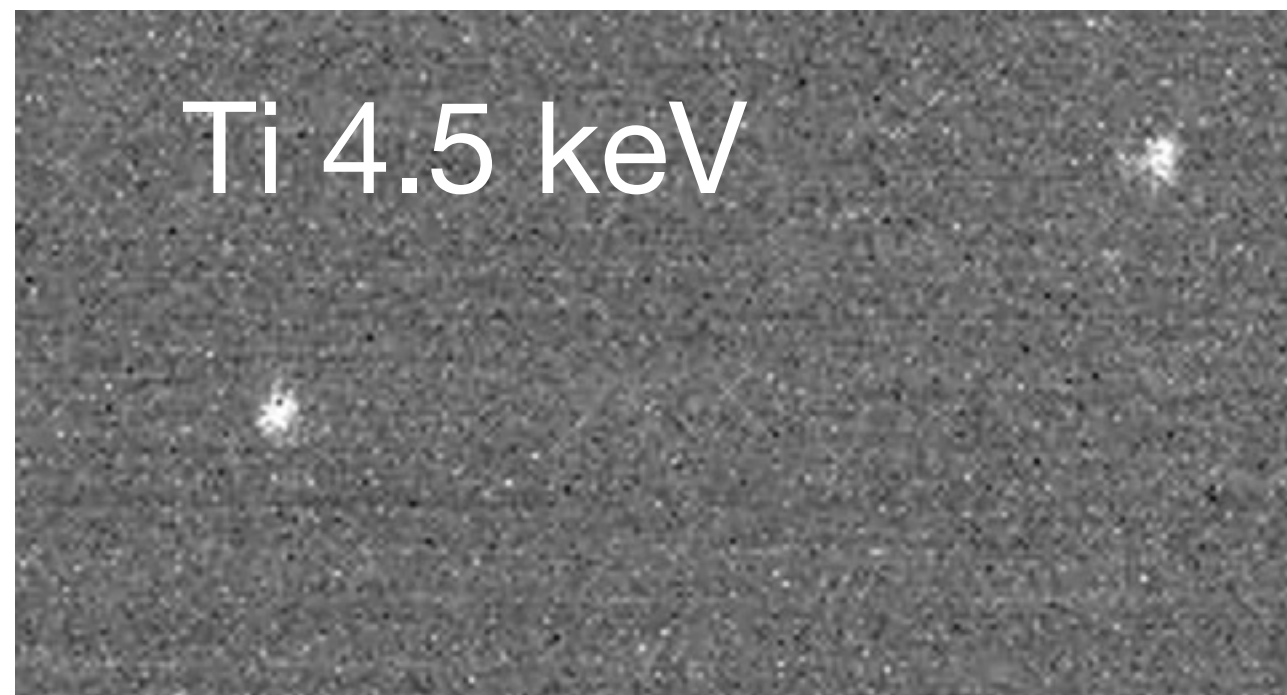


Titanium: another point in the linearity plot



This allowed to obtain a very good linearity in Energy response in the range 4.5 keV - 45 keV;

Experimental effects



While below 10 keV signals are spot-like, electrons with larger energies travel in gas.

This dilutes the charge arrival position and time and is expected to moderate the saturation effect

Cameras under test on LIME

Thanks to Roberto and Alex, different cameras were tested on LIME:



ORCA-Quest qCMOS, very low noise level

<https://www.hamamatsu.com/eu/en/product/type/C15550-20UP/index.html>

ORCA-Fusion-BT, back illuminated, more sensitive

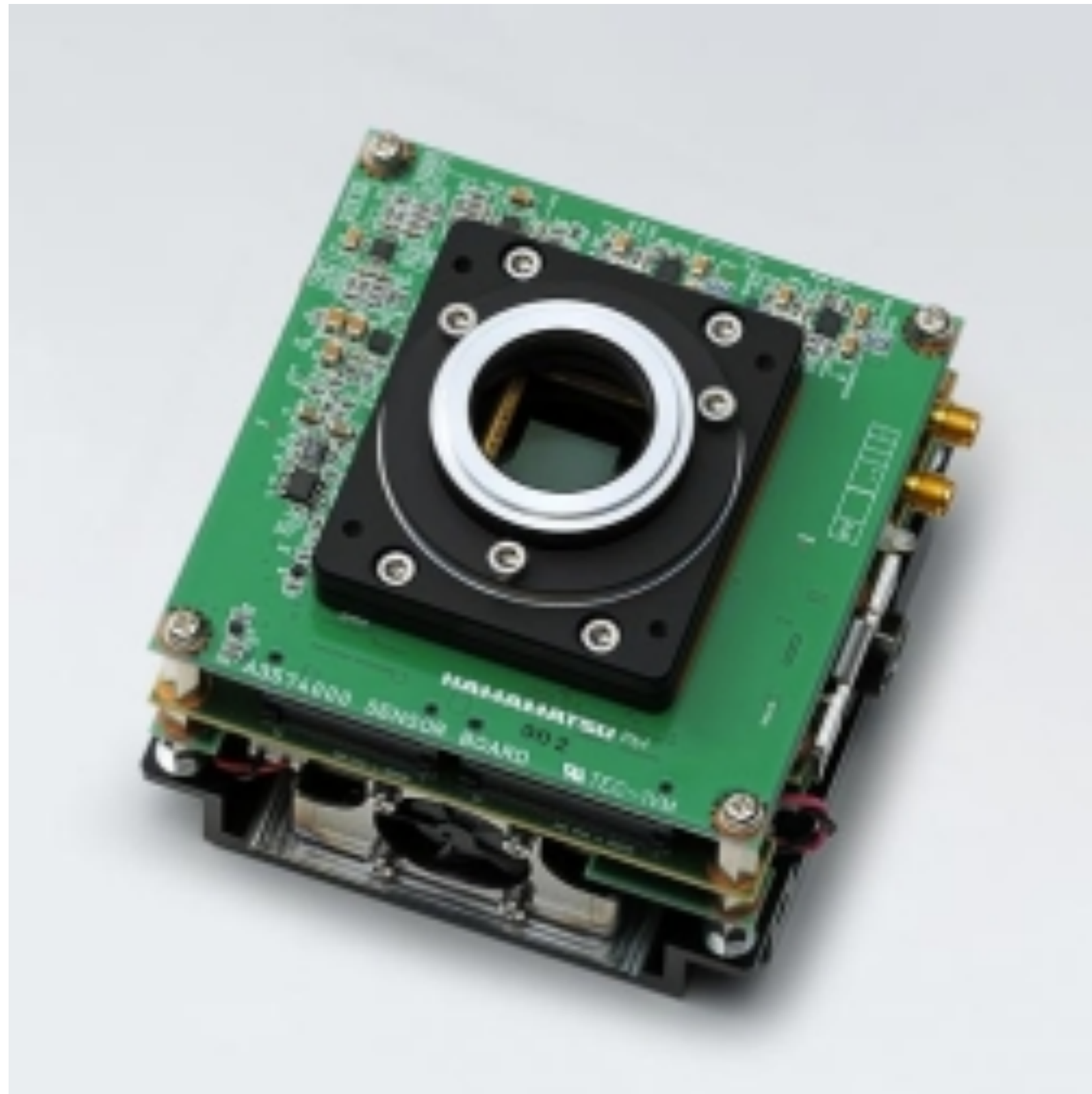
<https://www.hamamatsu.com/eu/en/product/type/C15440-20UP/index.html>

ORCA-Fusion, our usual one

<https://www.hamamatsu.com/eu/en/product/type/C14440-20UP/index.html>

Cameras under test on LIME

Now, Rita and Giovanni started a stability test with a sensor board



This board hosts an Orca sensor, not cooled at all;

If reasonable, this can be a starting point to develop a custom sensor, with lower radioactivity and lower price.