Energy linearity with X-rays on LIME

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X-rays sources

Davide took data with sources of X-rays from multiple sources (100 events each, 50ns camera aperture)

4384	100	50	no source - pedestal	60/40	He/CF4
4385	200	50	no source	60/40	He/CF4
4386	200	50	Xray source Cu 8.04/8.91 keV	60/40	He/CF4
4387	200	50	Xray source Rb 13.4/15 keV	60/40	He/CF4
4388	200	50	Xray source Mo 17.4/19.6 keV	60/40	He/CF4
4389	200	50	Xray source Ag 22.1/25 keV	60/40	He/CF4
4390	200	50	Xray source Ba 32.1/36.6 keV	60/40	He/CF4
4391	200	50	Xray source Tb 44.2/50.6 keV	60/40	He/CF4

| Target Selected	Energy (keV) K_alpha	K_beta	Photon Yield (#/sec/steradian)
Cu	8.04	8.91	2,500
Rb	13.37	14.97	8,800
Mo	17.44	19.63	24,000
Ag	22.10	24.99	38,000
Ba	32.06	36.55	46,000
Tb	44.23	50.65	76,000

Possibility to study the linearity of energy response at the various sources.

Data is reconstructed and selection is very simple (short and isolated tracks to kill "cosmics", delta rays and unclustered pieces of tracks)
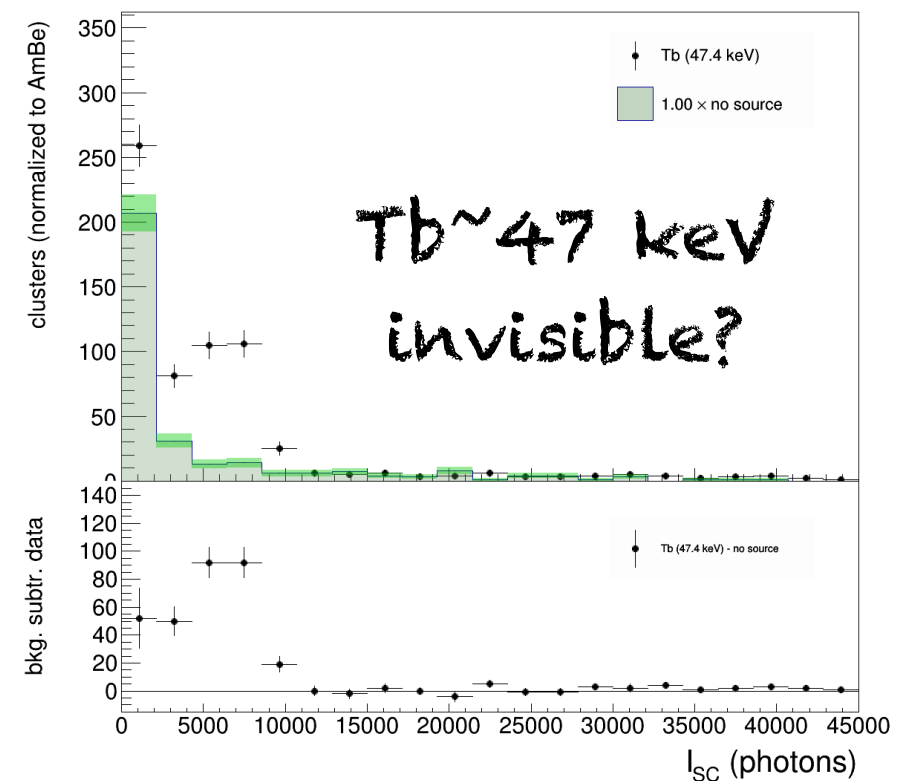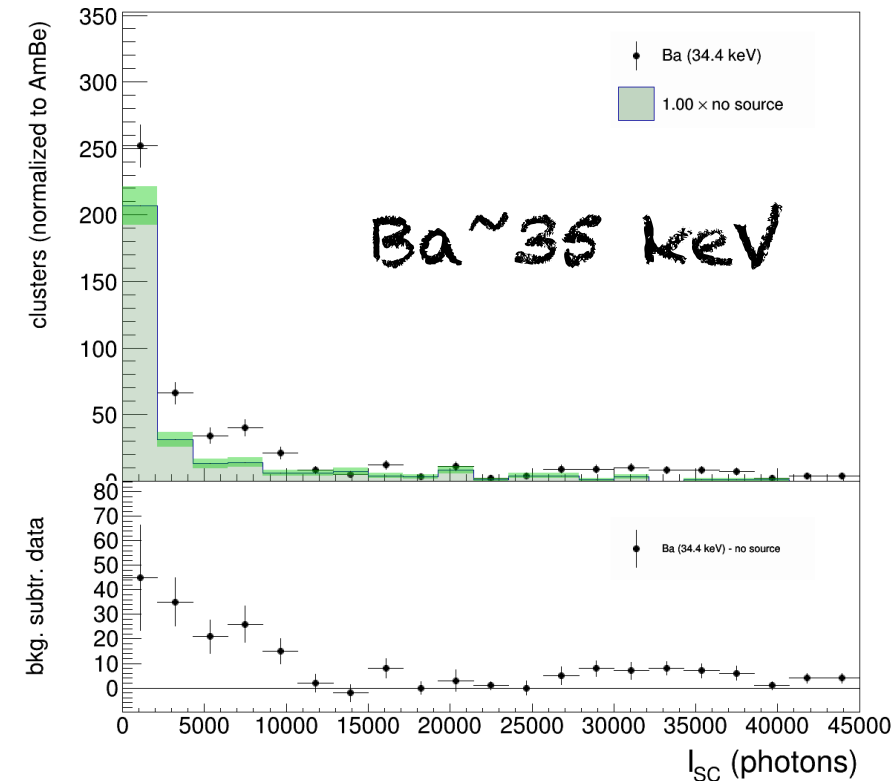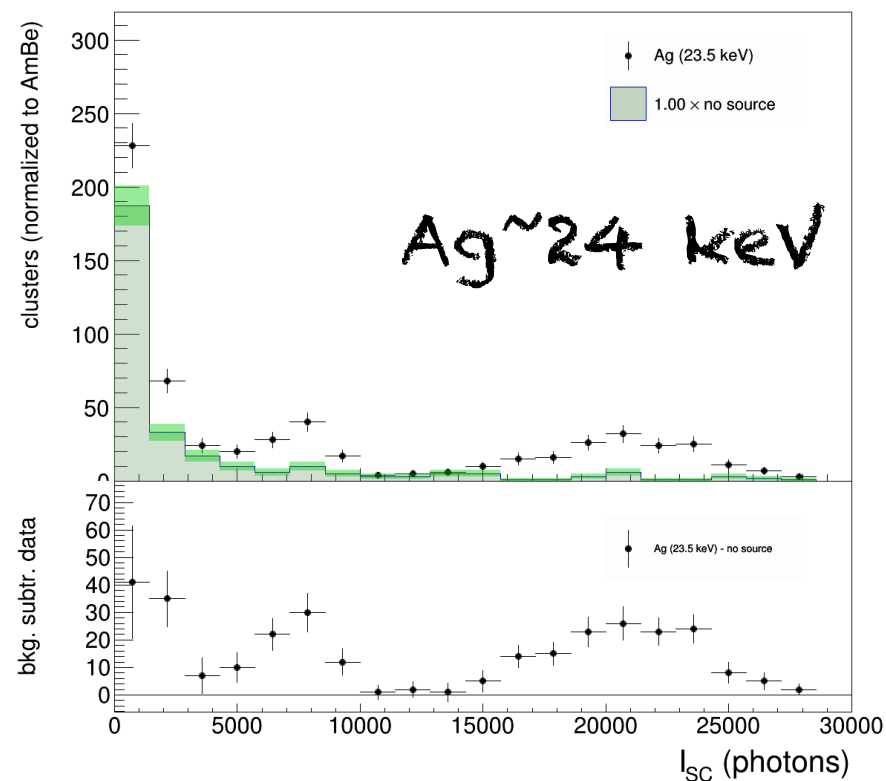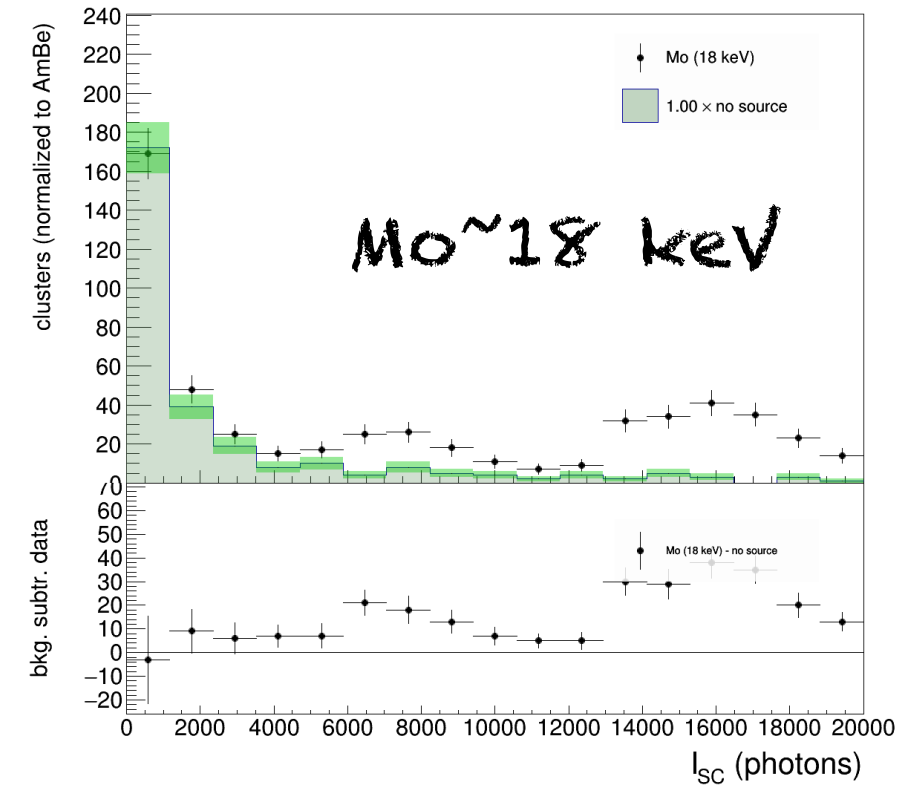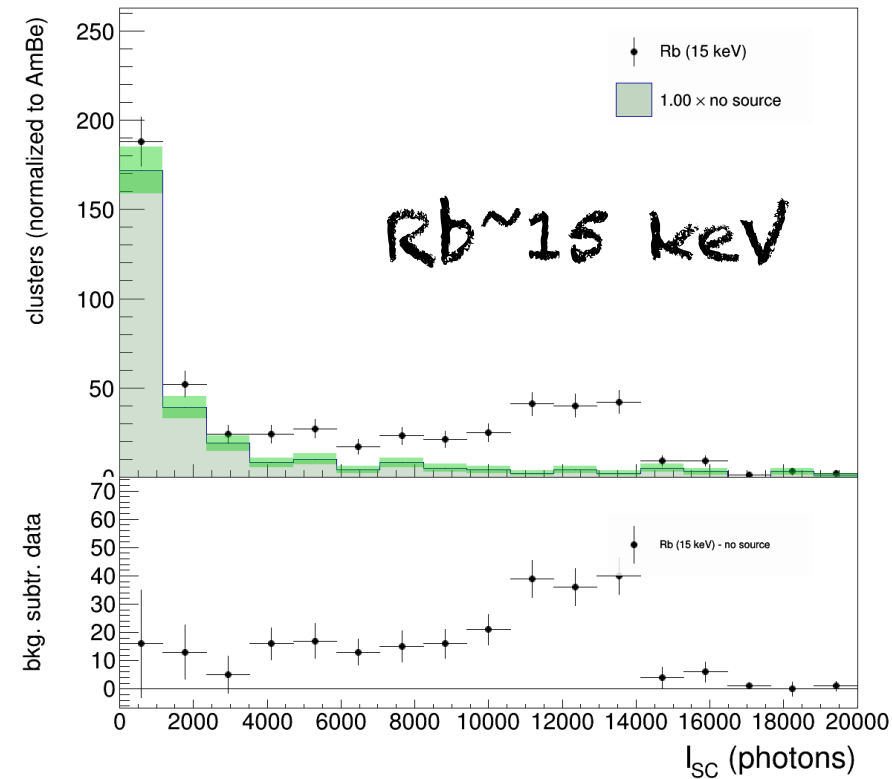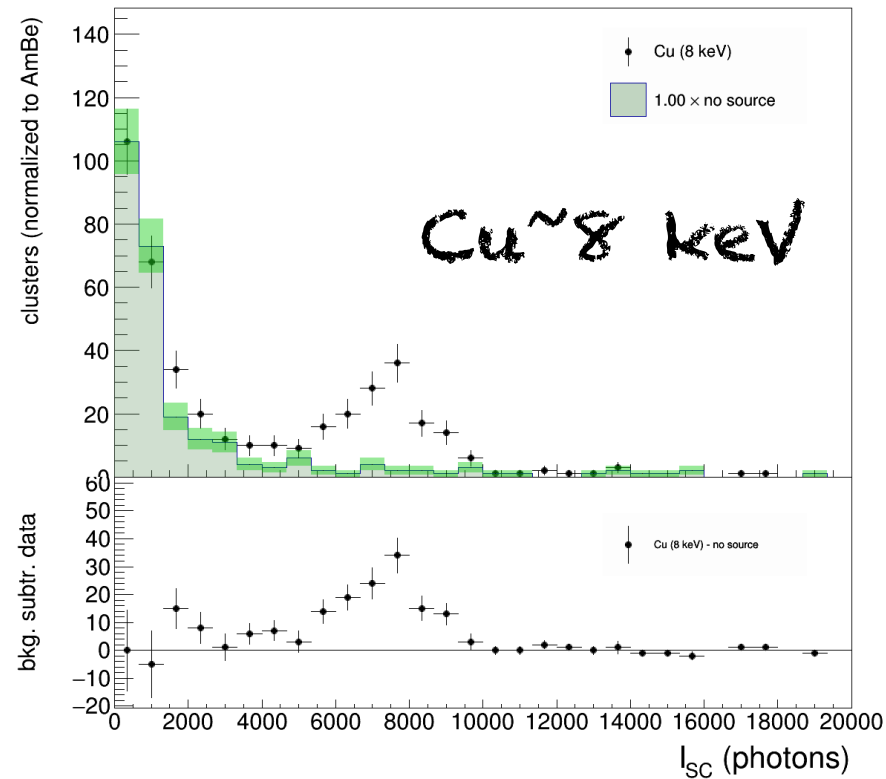
No selection on energy density (delta variable) not to bias energy

Raw event displays

selection detail: track length cut a bit relaxed for higher energies
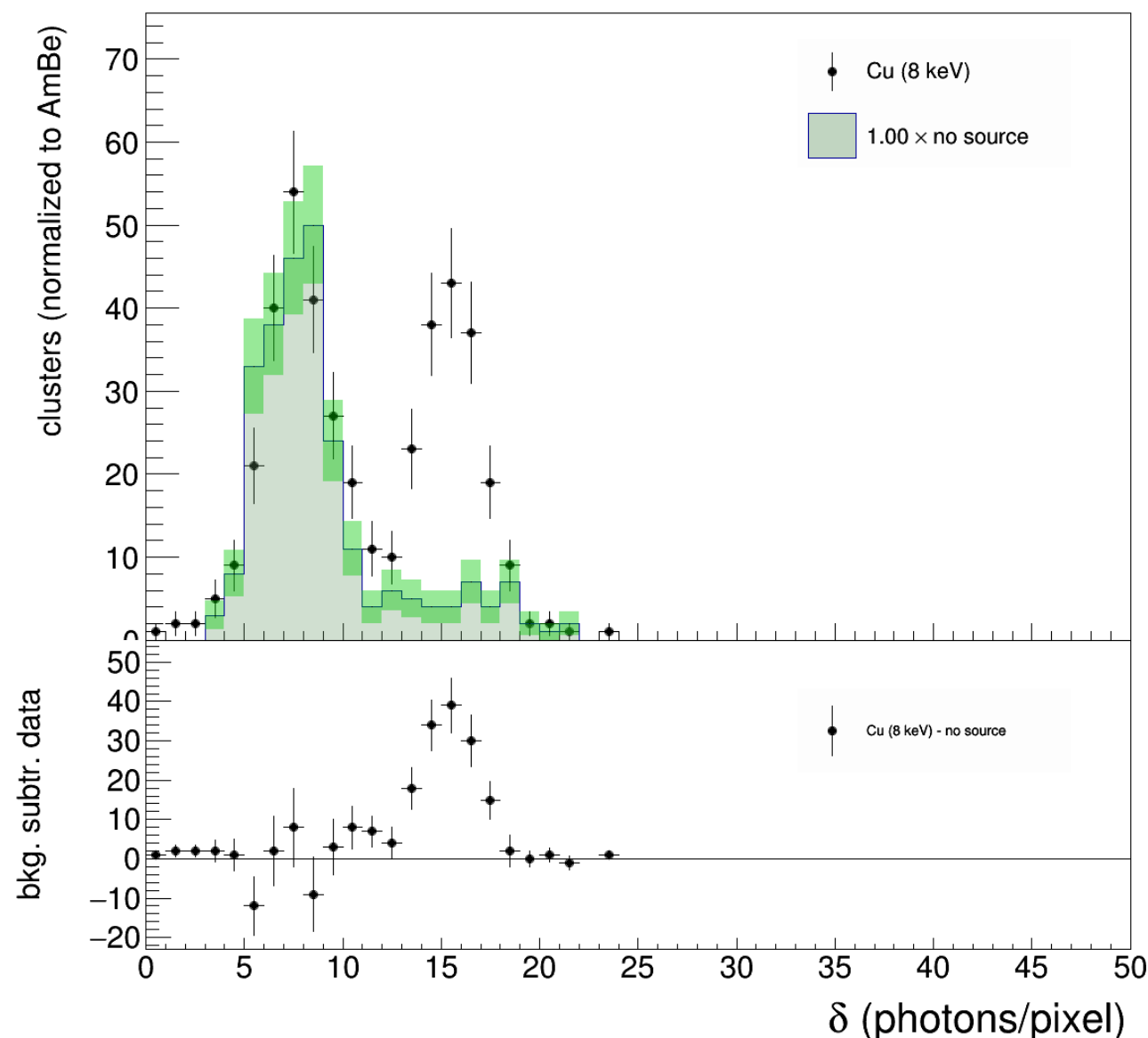

Rb~15 keV

Mo~18 keV

Ag~24 keV

Ba~35 keV
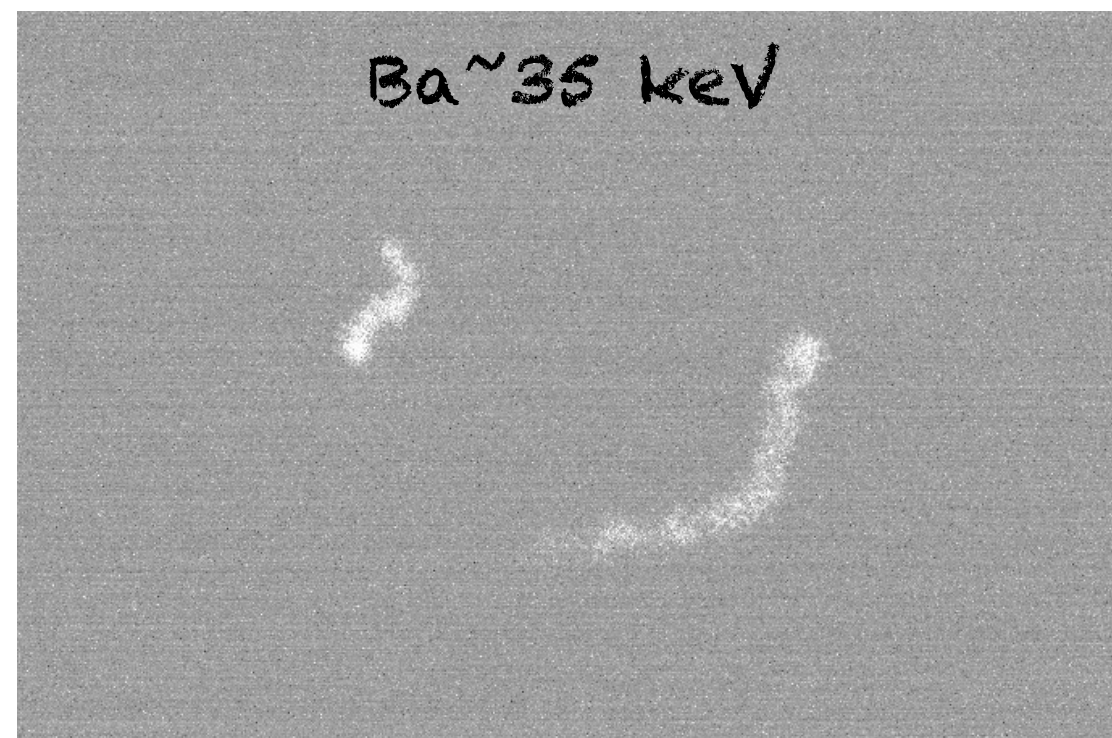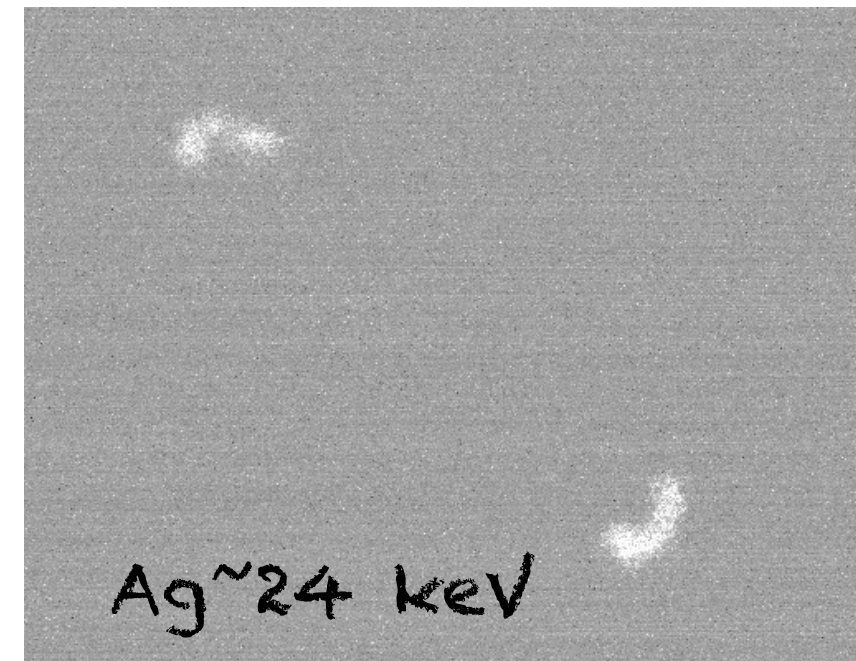
energy spectra

Energy density is still a very good discriminating variable.
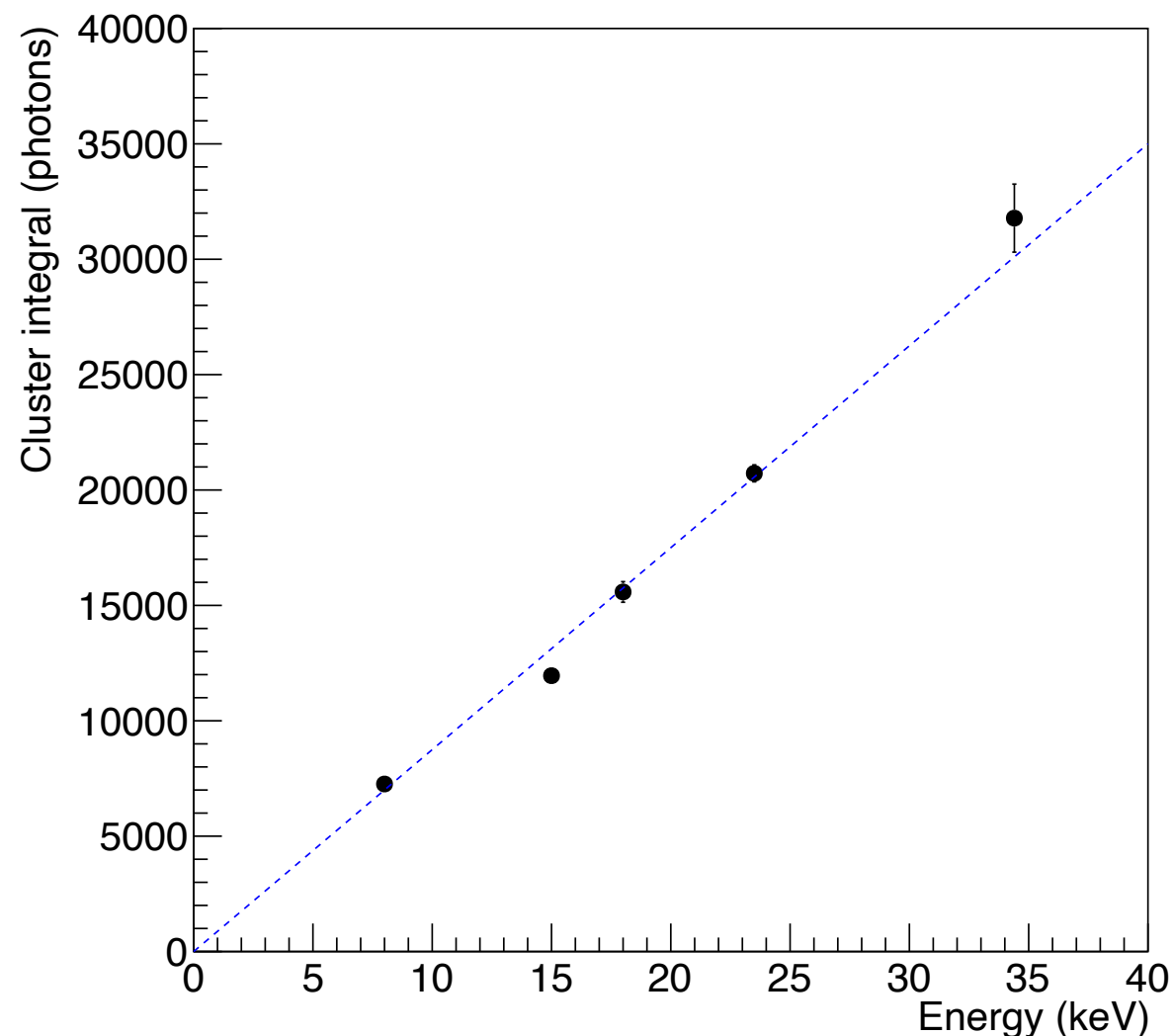
It is NOT used here, not to bias energy, and because bkg-subtraction works fine (bkg is flat in the energy ranges of interest)
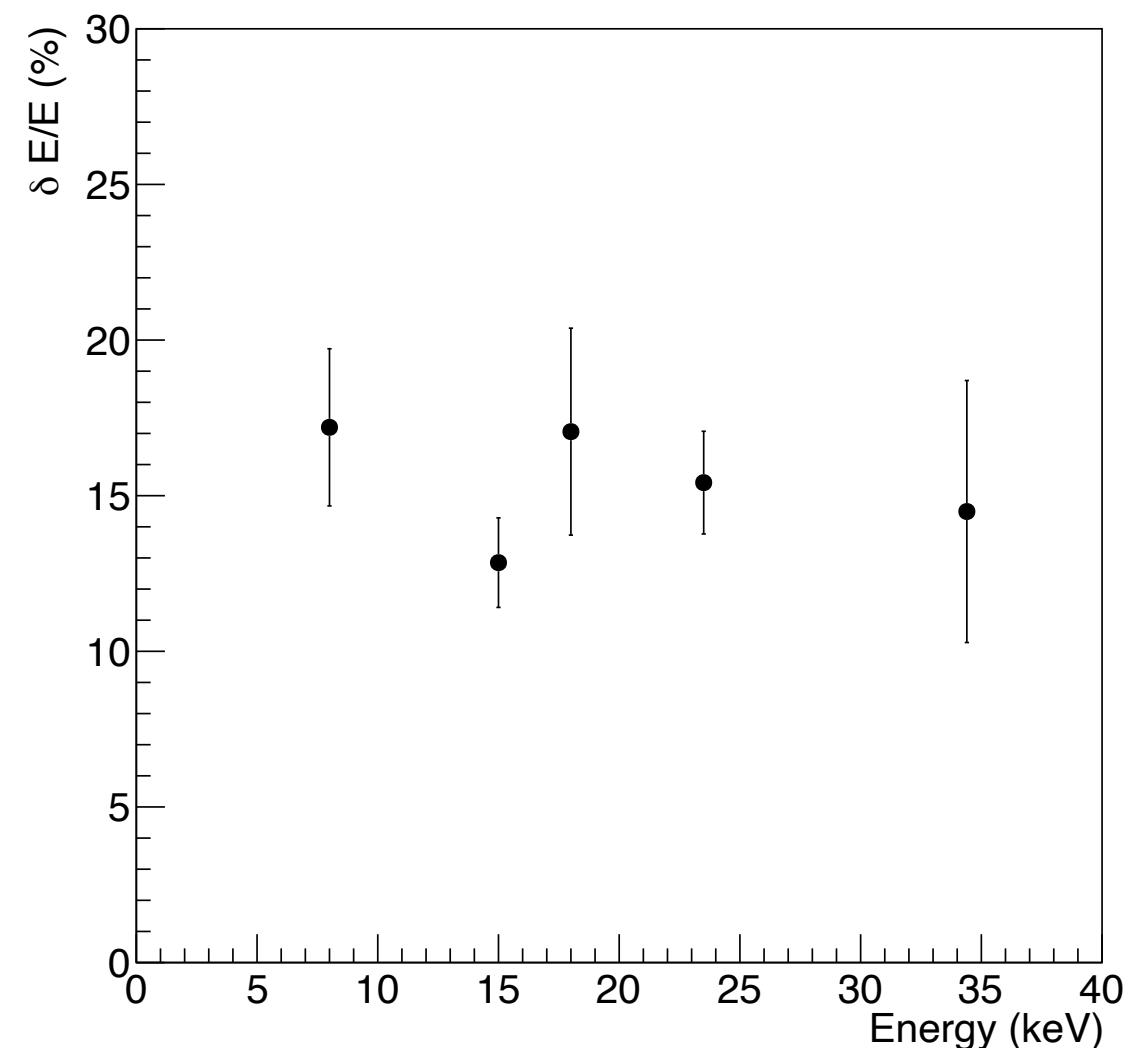
Bkg is subtracted from no-source data, and the resulting spectrum is fitted with a simple Gaussian.

Other bumps are seen (eg. in Ag), but used only the expected one. To be checked if they correspond to real lines

energy response

energy resolution

Conclusions

Analyzed with a simple selection the data taken by Davide with different sources of X-rays

Apart Tb, the photo-electric peaks of the sources can be seen, and the response of LIME seems proportional to the true E in the range [8-35] keV.

Energy resolution around 15% (no correction apart optical vignetting is applied)

Understanding of the origin of the other peaks apart the principal ongoing

One can include Fe and take a bunch of data to better study the energy response and resolution