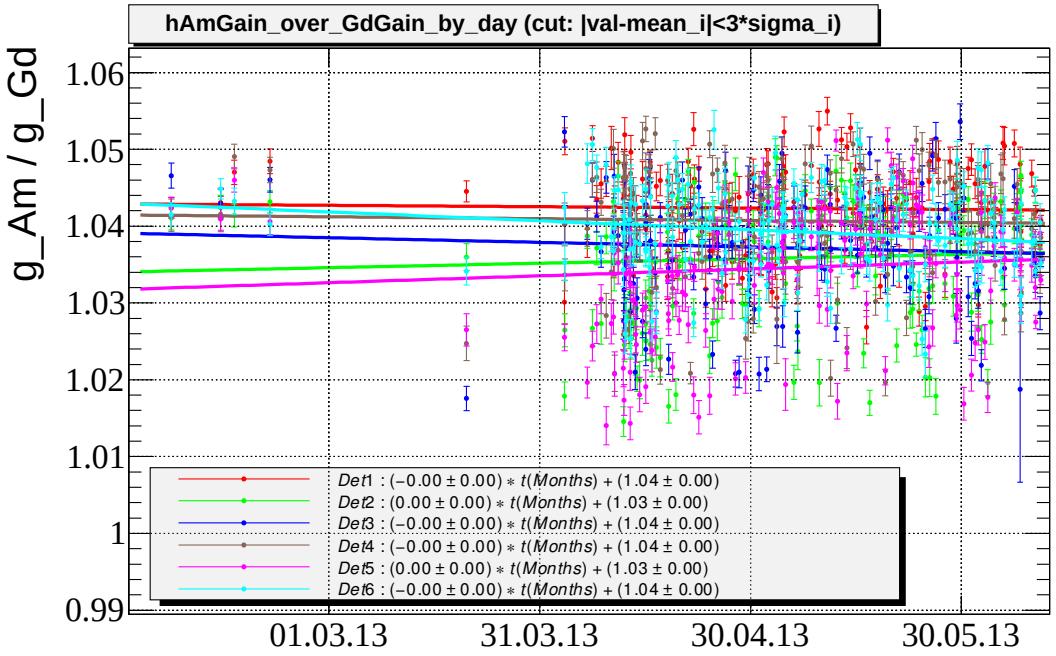
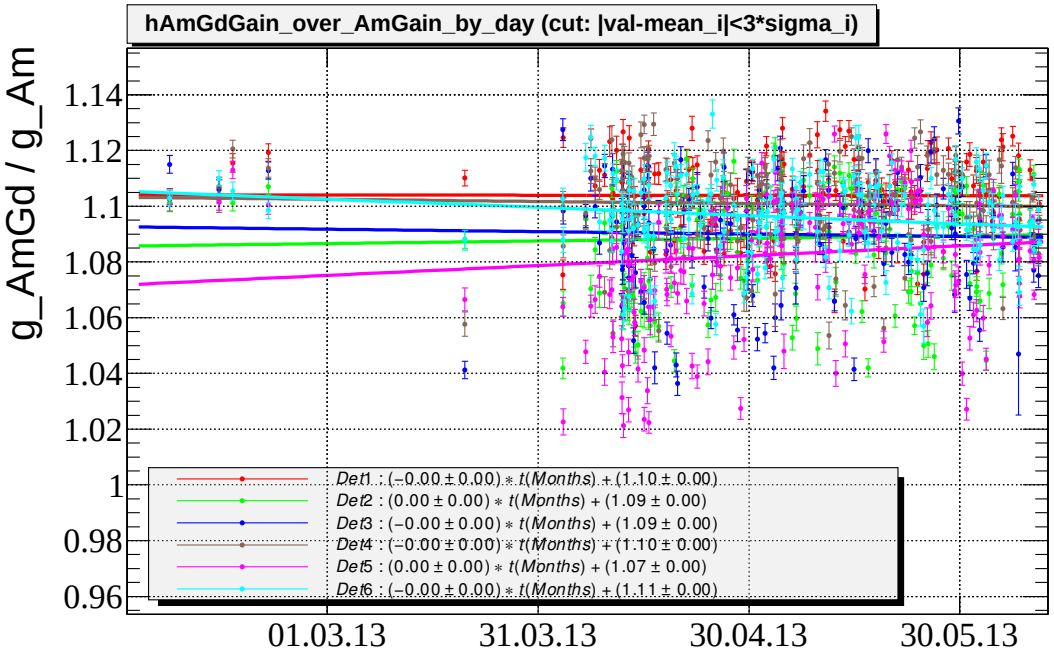
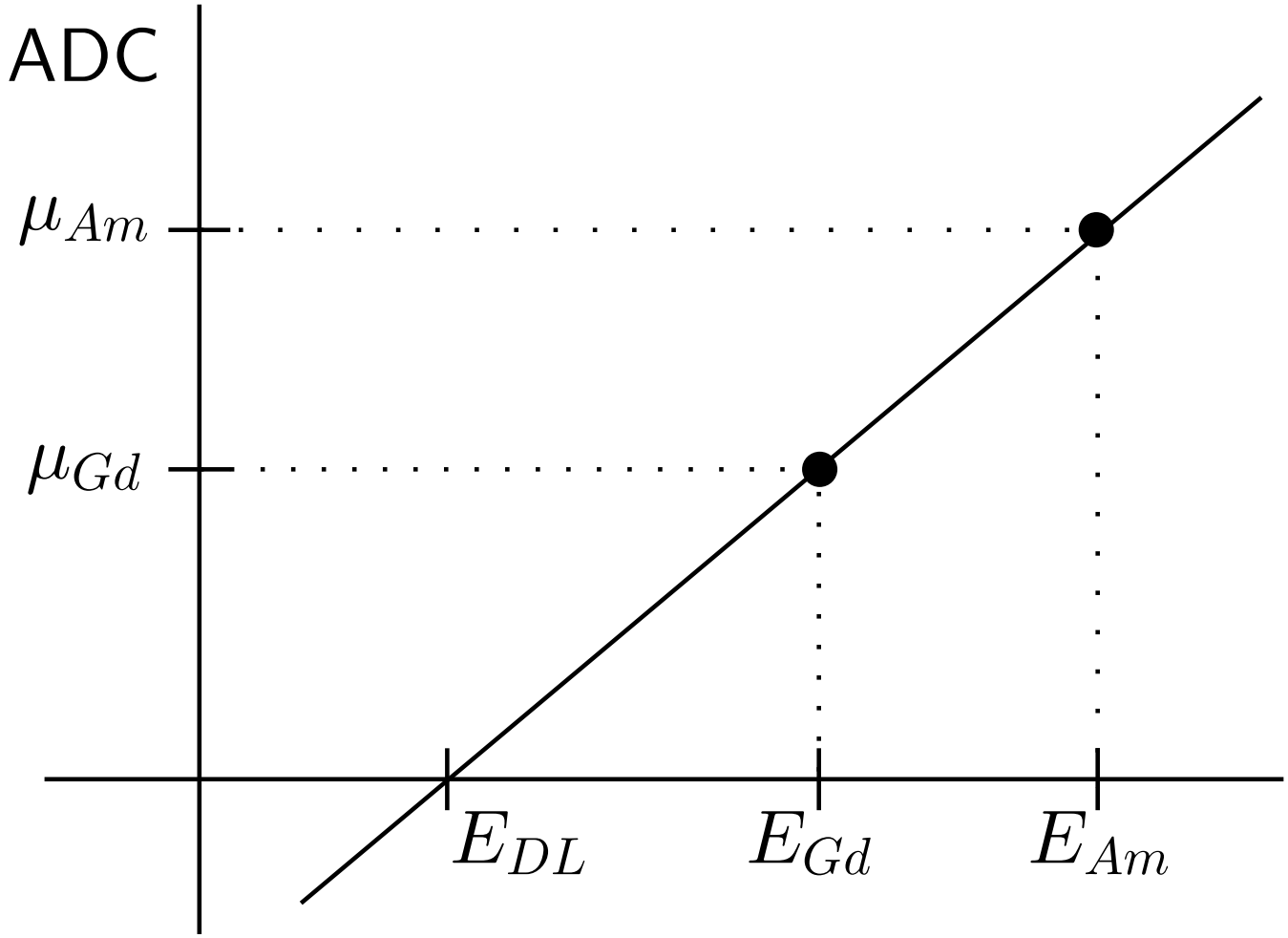
Gain relations



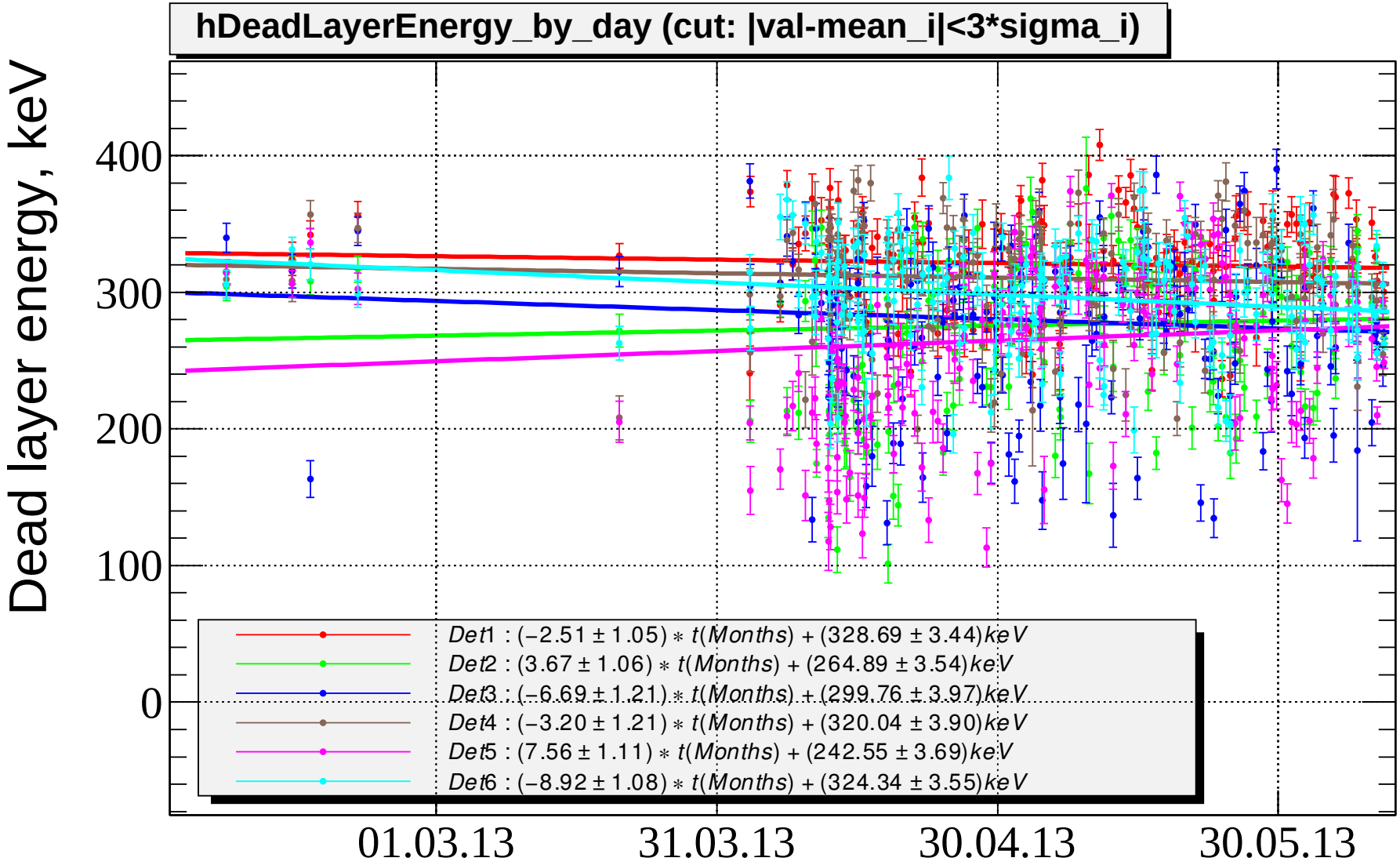


Calibration curve scheme

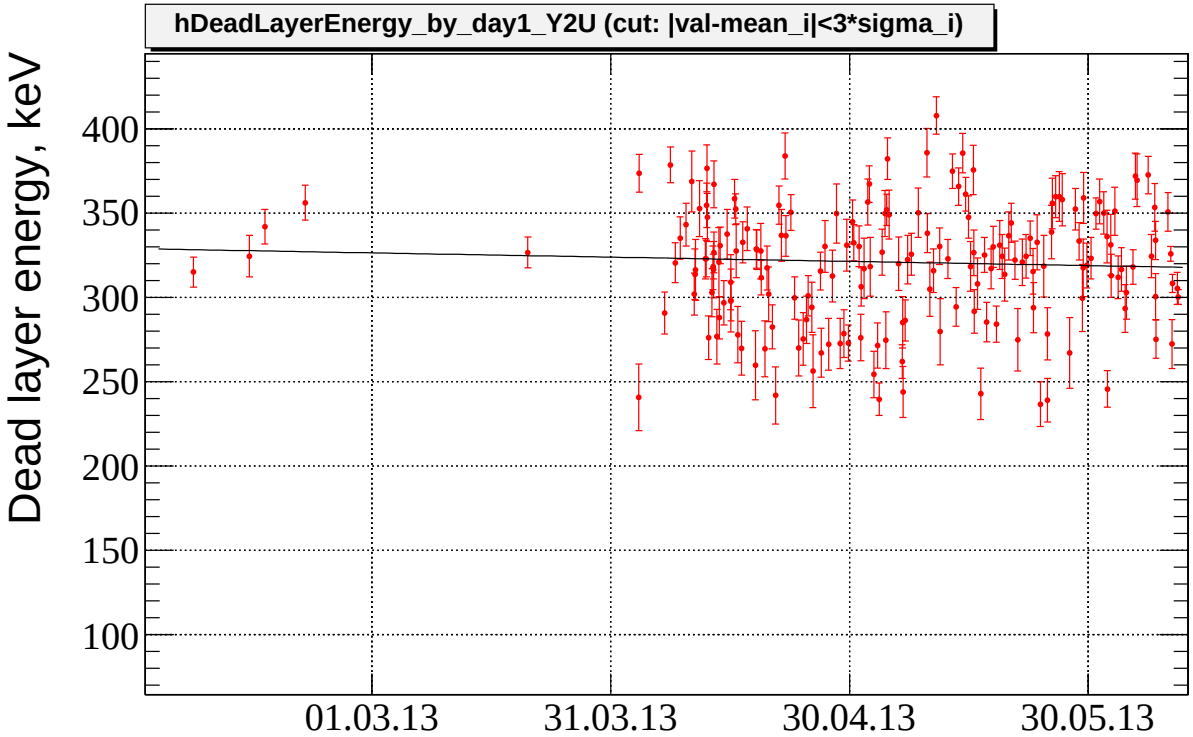


Dead layer energy (E_{DL})

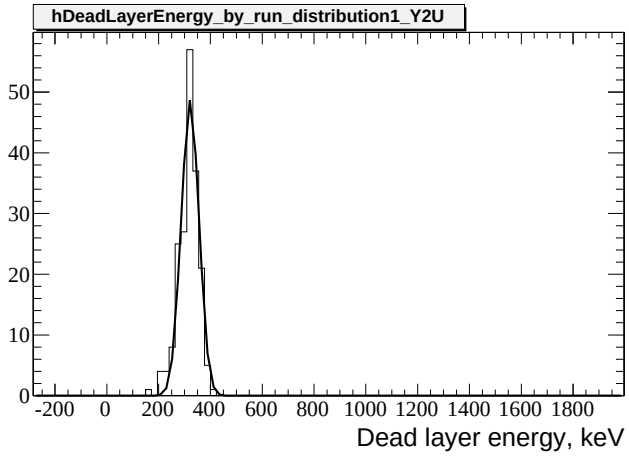
Obtained by fitting calibration points with $(x - E_{DL}) * g$.

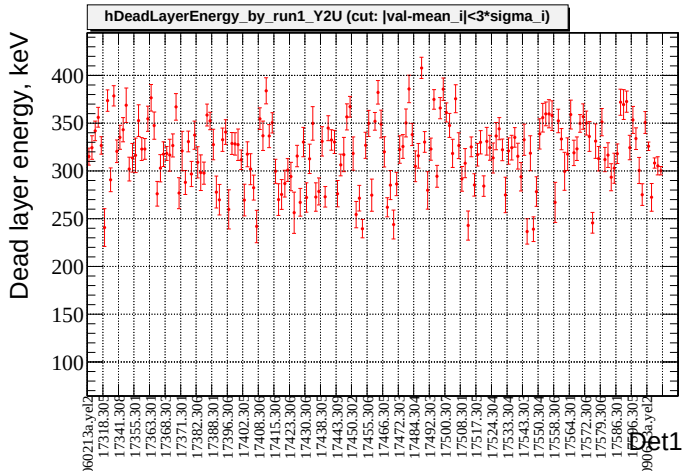


Dead layer energy, Detector 1

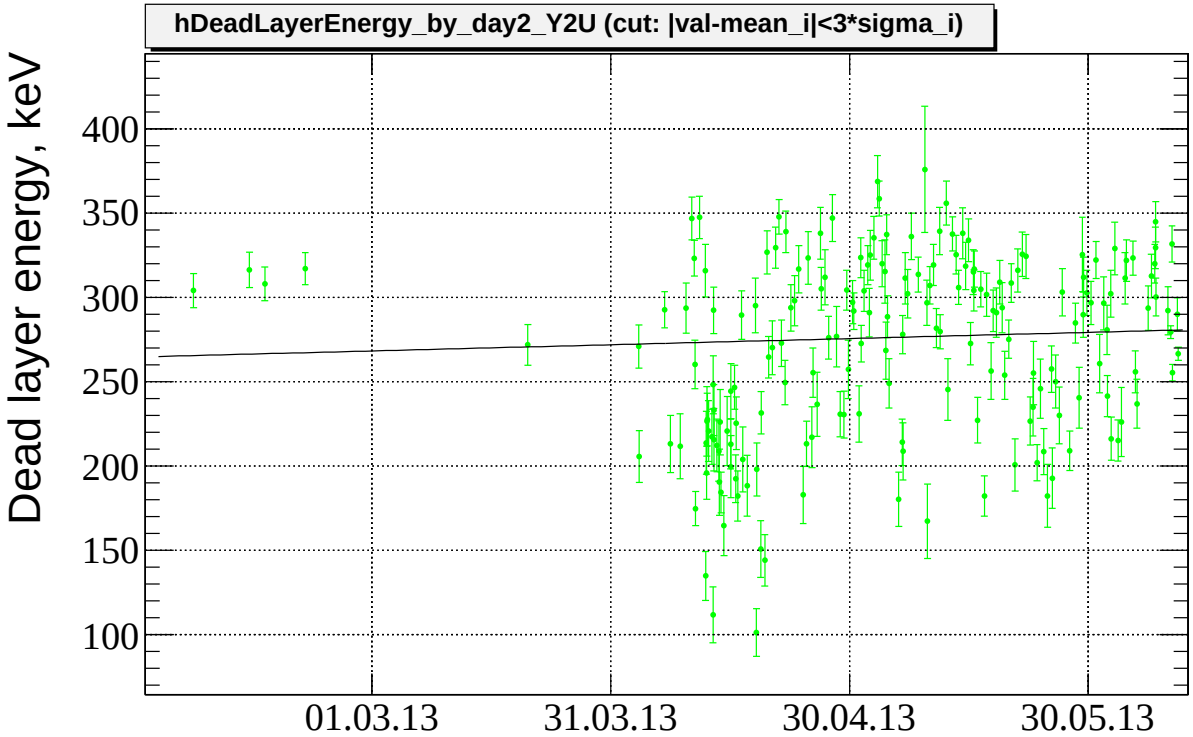


$Det1 : (-2.51 \pm 1.05) * t(Months) + (328.69 \pm 3.44) keV$

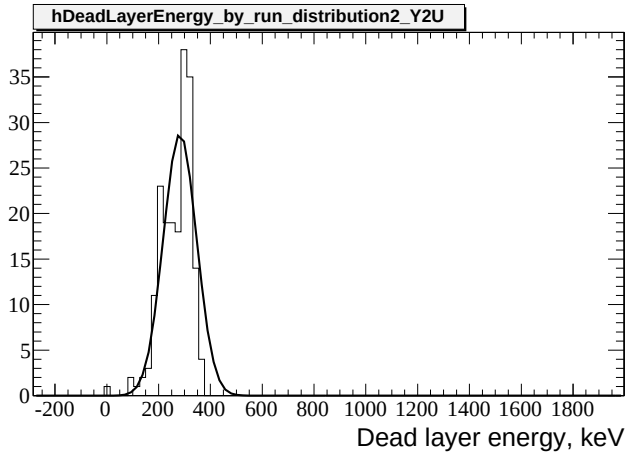


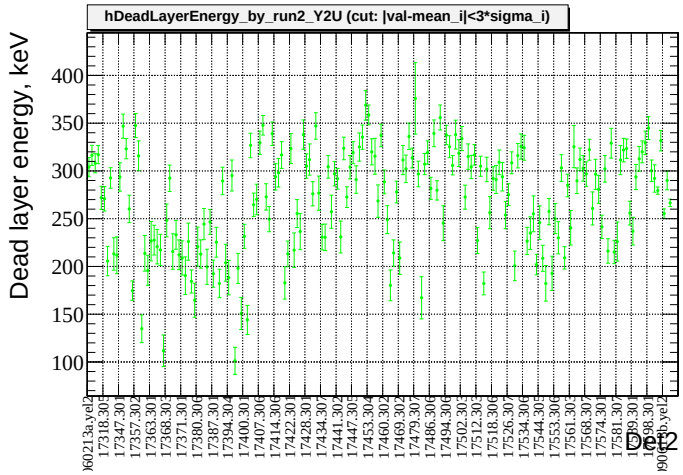


Dead layer energy, Detector 2

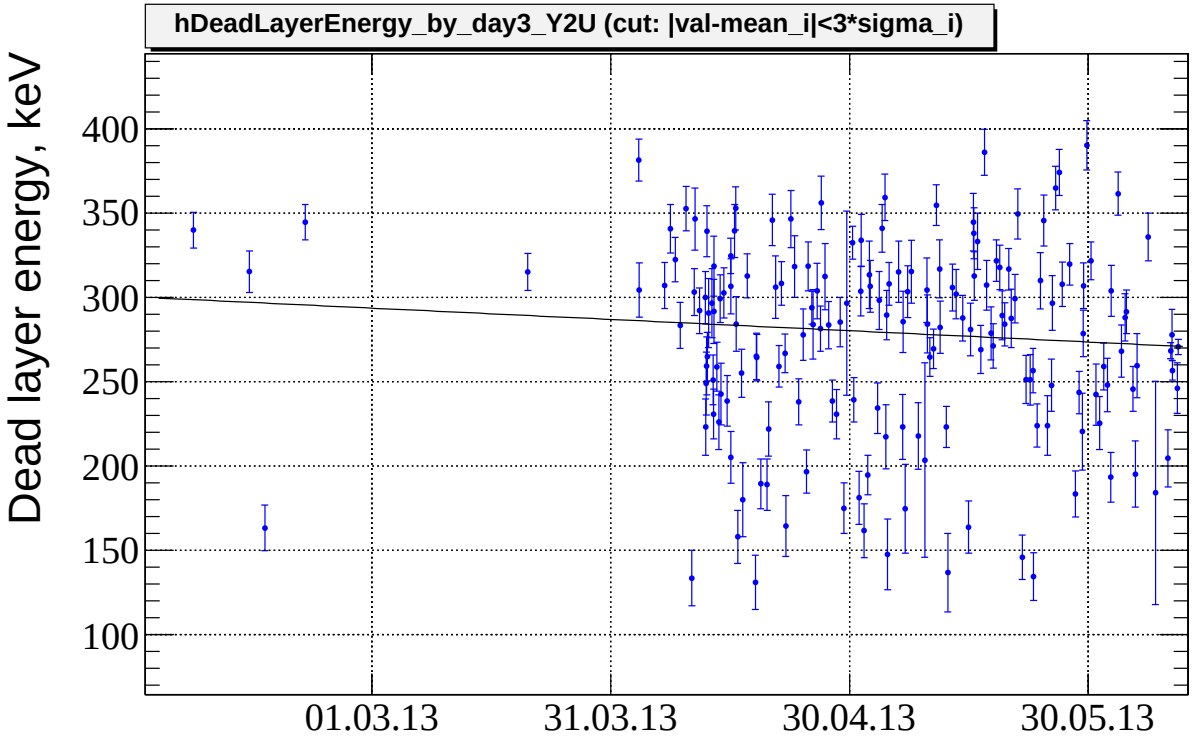


$Det2 : (3.67 \pm 1.06) * t(Months) + (264.89 \pm 3.54) keV$

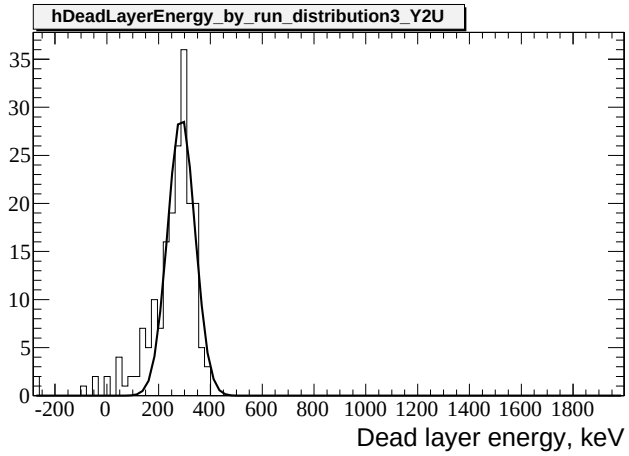


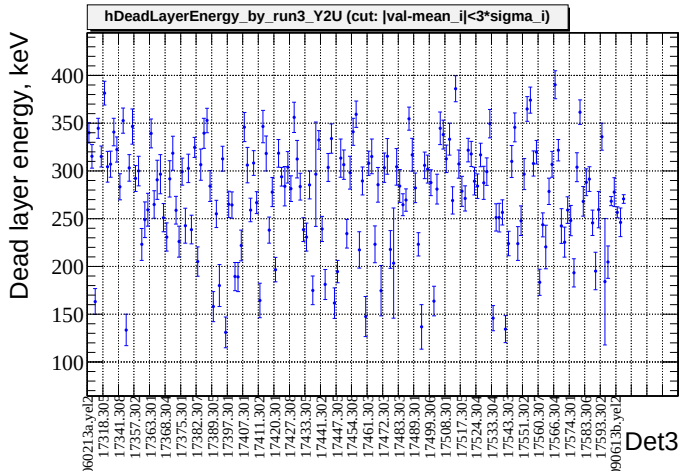


Dead layer energy, Detector 3

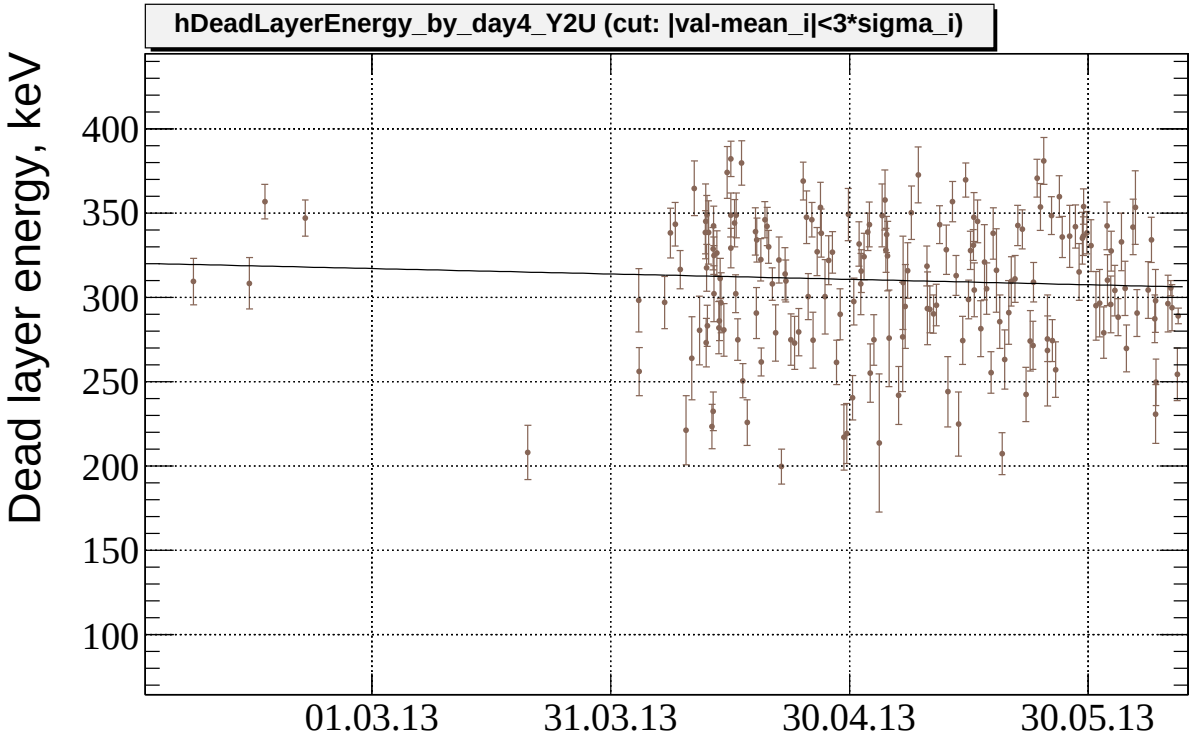


$Det3 : (-6.69 \pm 1.21) * t(Months) + (299.76 \pm 3.97) keV$

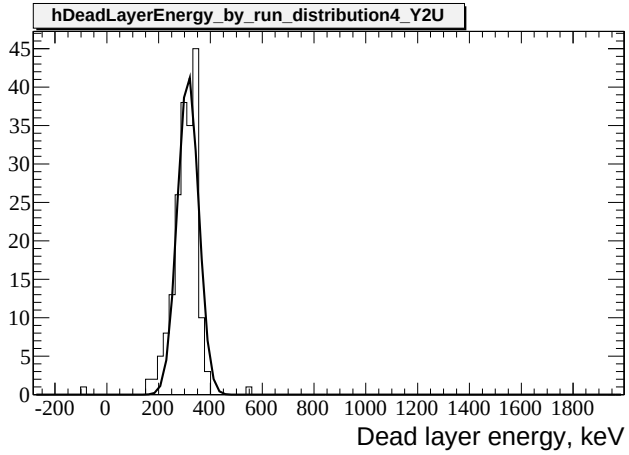


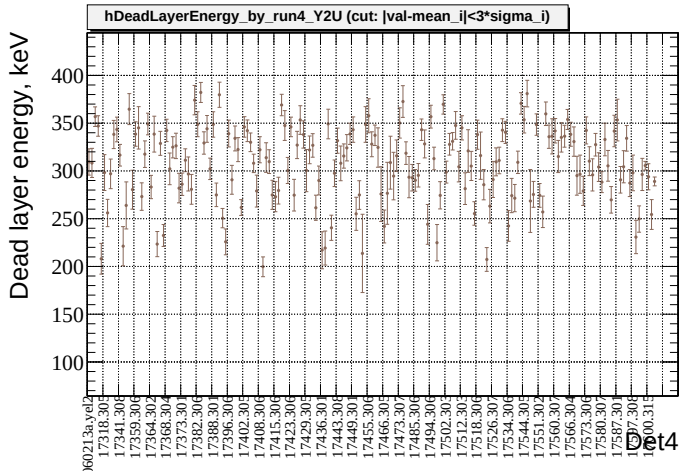


Dead layer energy, Detector 4

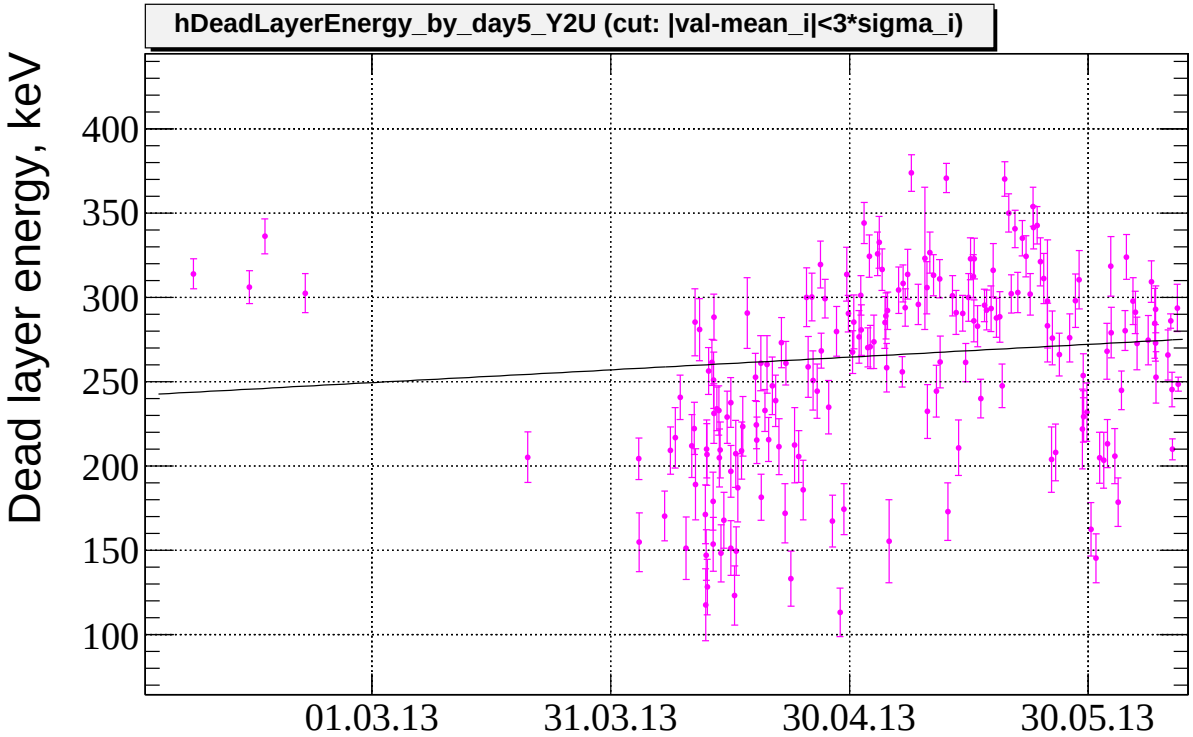


$Det4 : (-3.20 \pm 1.21) * t(Months) + (320.04 \pm 3.90) keV$

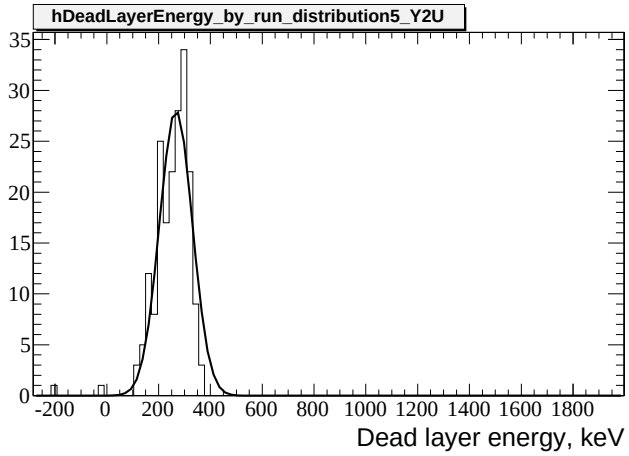


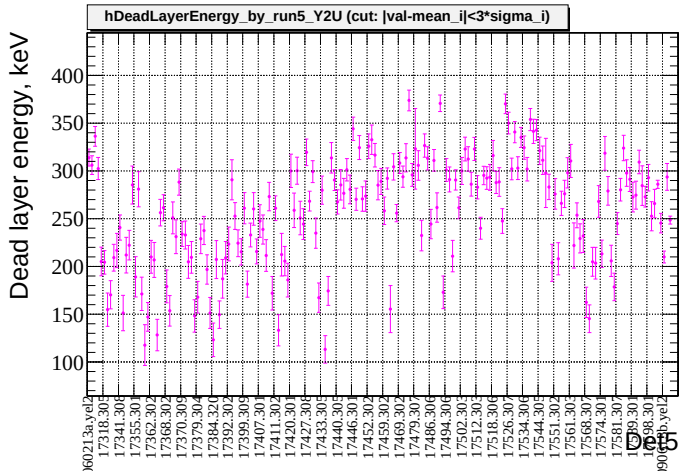


Dead layer energy, Detector 5

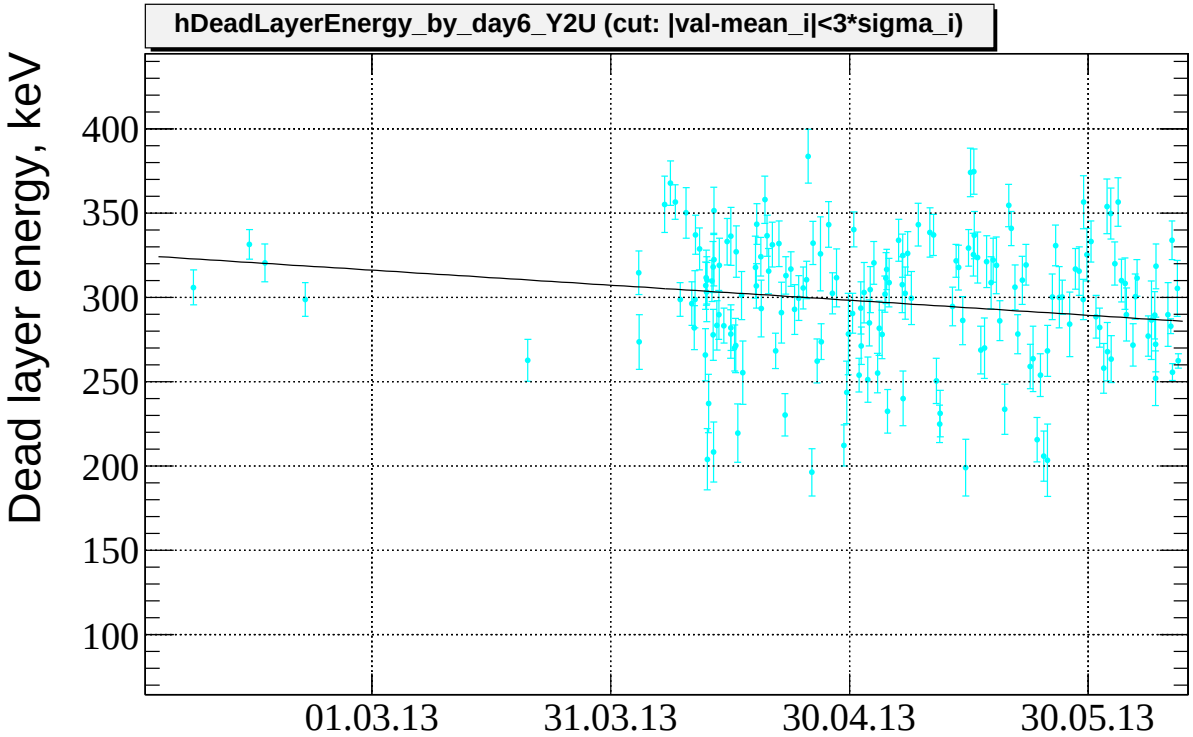


$Det5 : (7.56 \pm 1.11) * t(Months) + (242.55 \pm 3.69) keV$

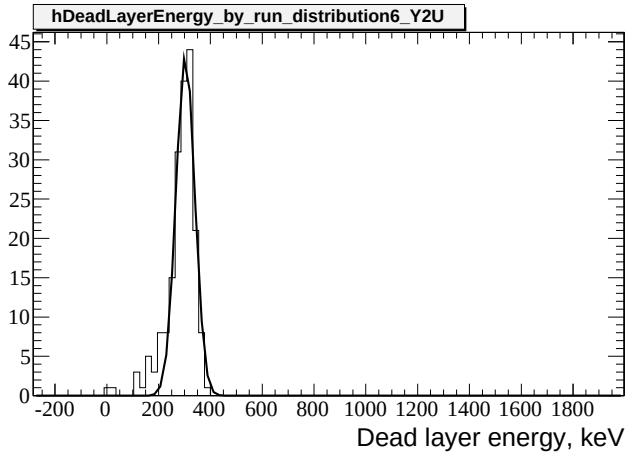


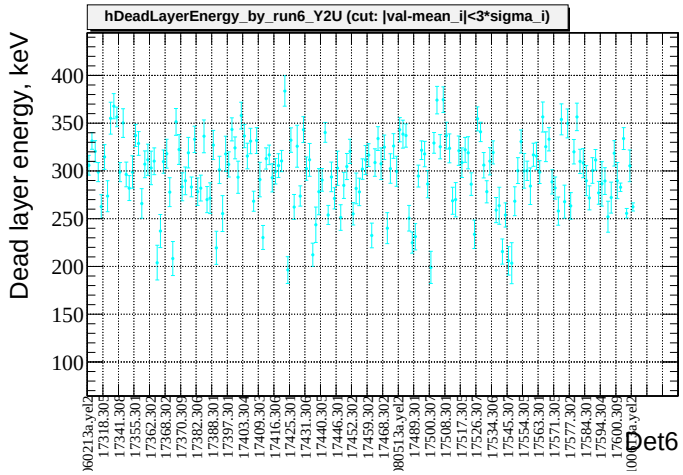


Dead layer energy, Detector 6



$Det6 : (-8.92 \pm 1.08) * t(Months) + (324.34 \pm 3.55) keV$





Naive dead layer energy calculation

Top estimate:

$$E_{DL} \simeq 330 \text{ keV} \tag{1}$$

$$\frac{dE}{dx} \simeq 0.14 \text{ MeV}/\mu\text{m} \tag{2}$$

$$\rightarrow x = 2.3 \ \mu\text{m} \tag{3}$$

Dead layer energy, different alpha's stopping power

Gain equality (μ - ADC, E - measured energy):

$$\frac{\mu_{Am}}{E_{Am} - E_{DLAm}} = \frac{\mu_{Gd}}{E_{Gd} - E_{DLGd}} \tag{4}$$

and constant stopping power approximation:

$$E_{DLAm} \simeq x_{DL}\lambda_{Am} \qquad E_{DLGd} \simeq x_{DL}\lambda_{Gd} \tag{5}$$

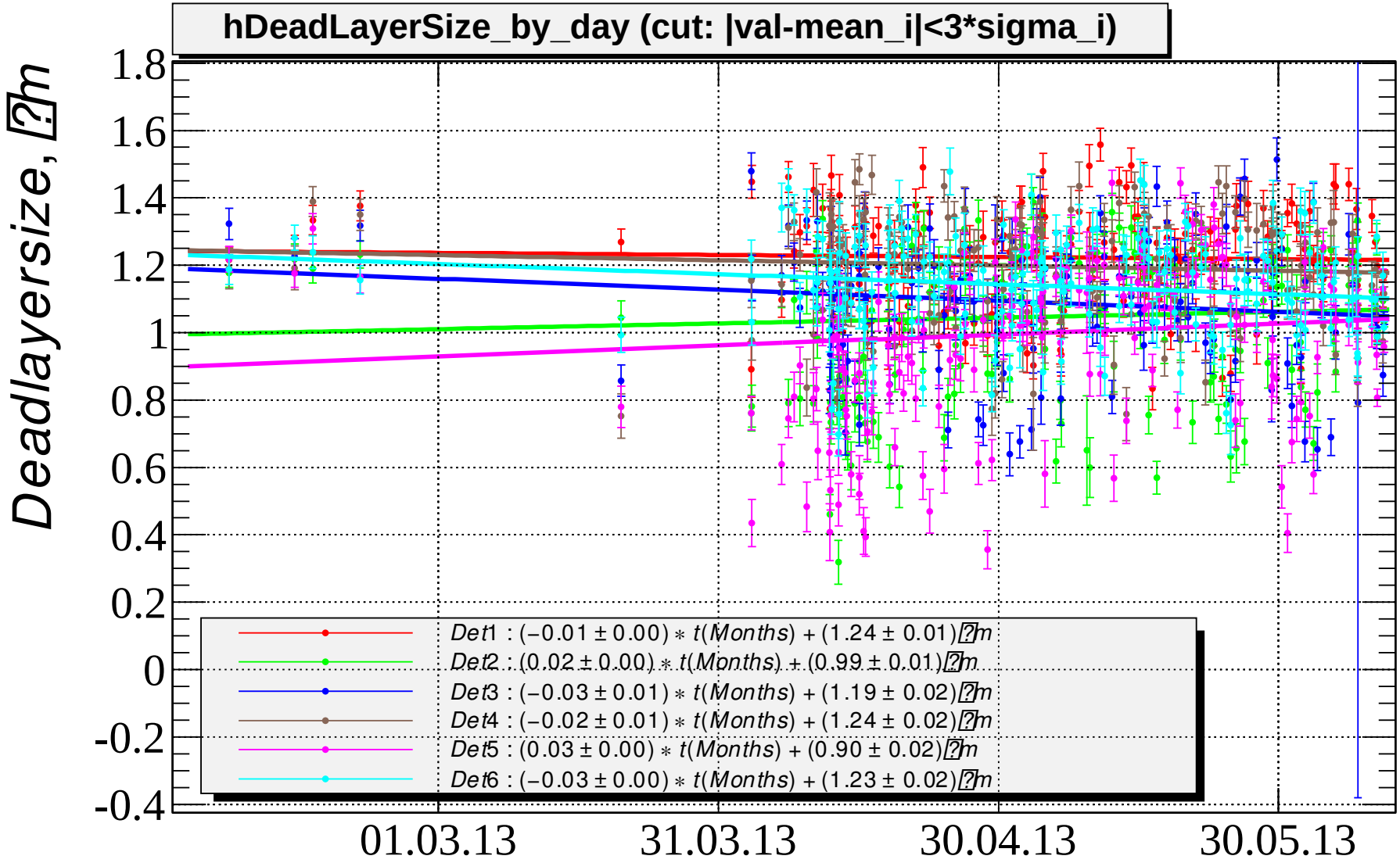
yield:

$$x_{DL} = \frac{\mu_{Gd}E_{Am} - \mu_{Am}E_{Gd}}{\mu_{Gd}\lambda_{Am} - \mu_{Am}\lambda_{Gd}} \tag{6}$$

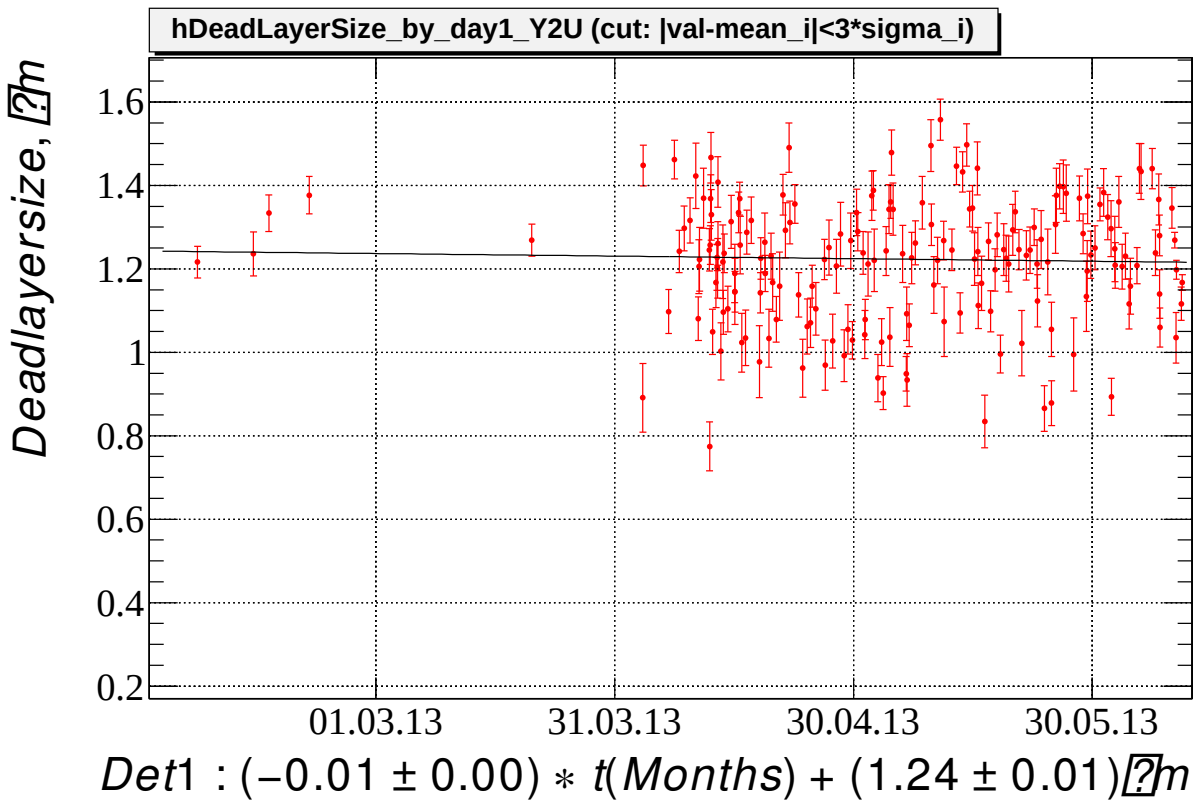
In the case of $\lambda_{Am} = \lambda_{Gd}$ this degenerates into a simple line fit

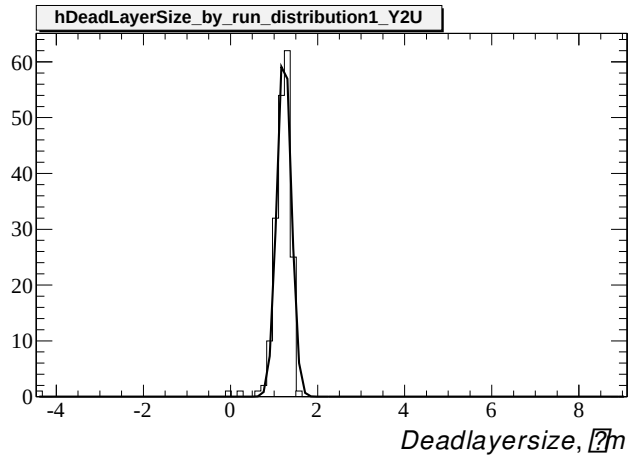
Dead layer size (x_{DL})

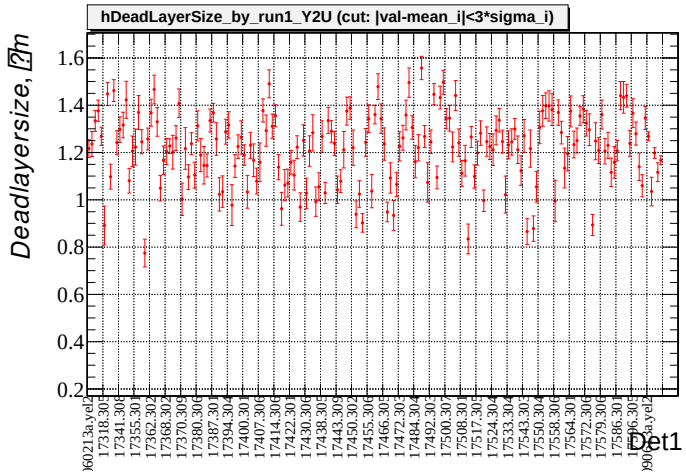
$$\lambda_{Gd} = 190 \text{ keV}/\mu\text{m} \qquad \lambda_{Am} = 140 \text{ keV}/\mu\text{m}. \tag{7}$$



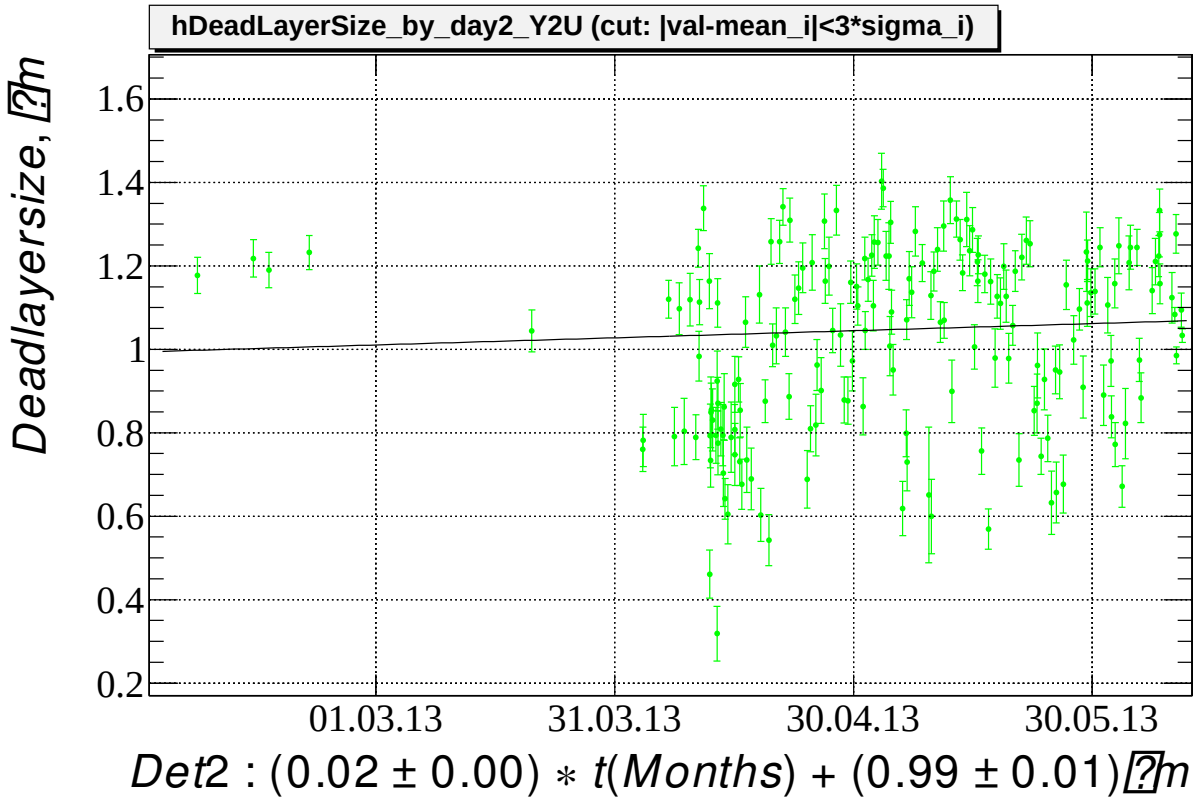
Dead layer size, Detector 1

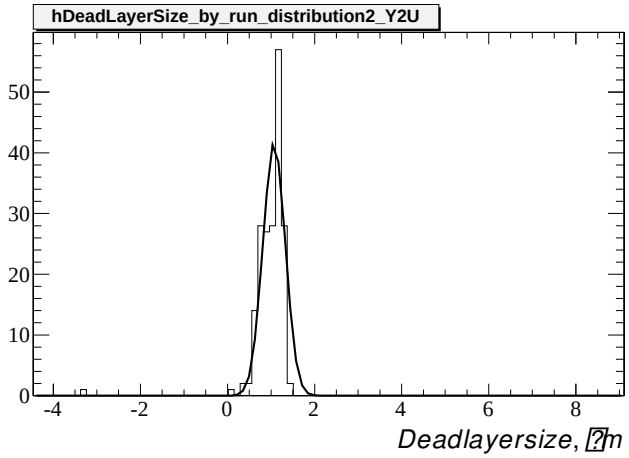


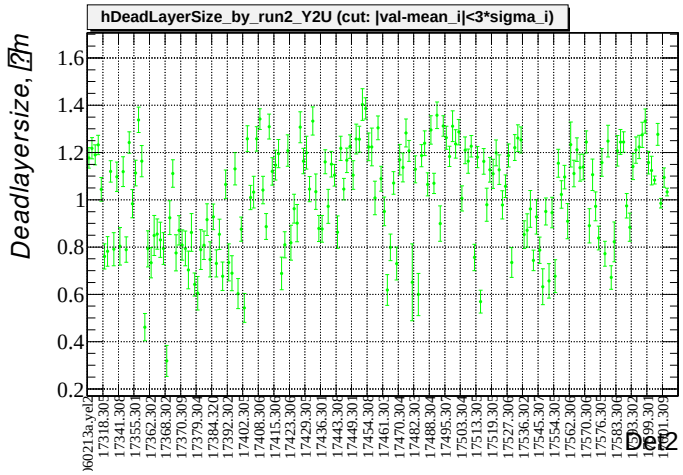




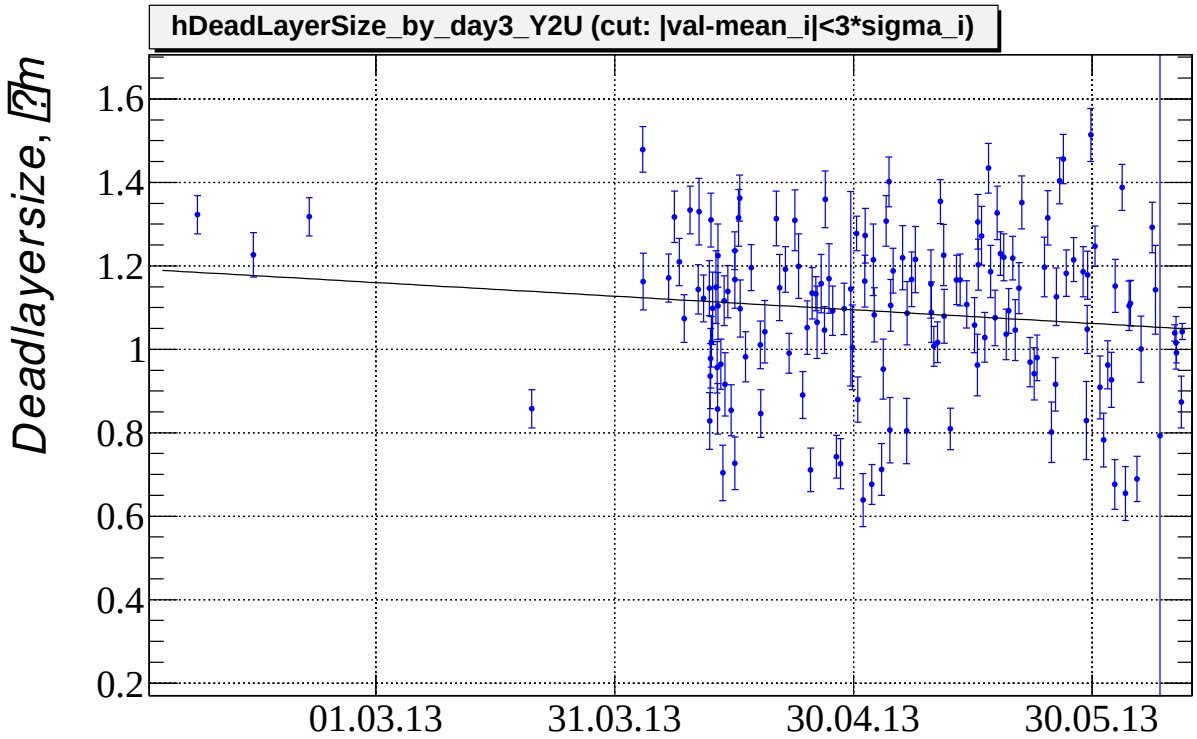
Dead layer size, Detector 2



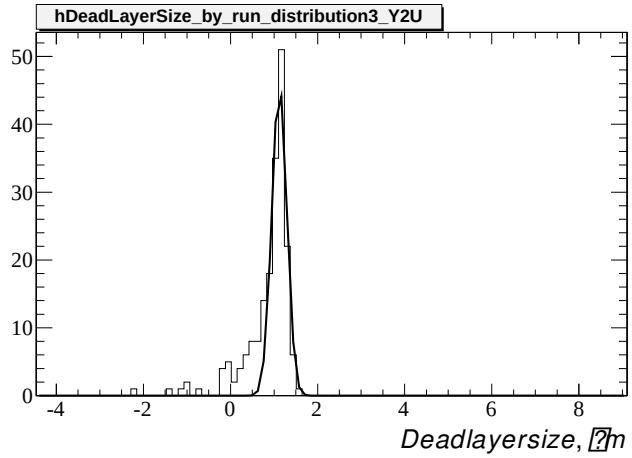


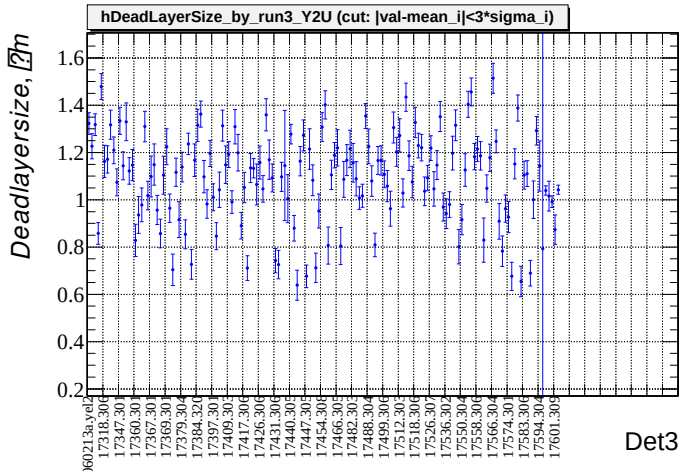


Dead layer size, Detector 3

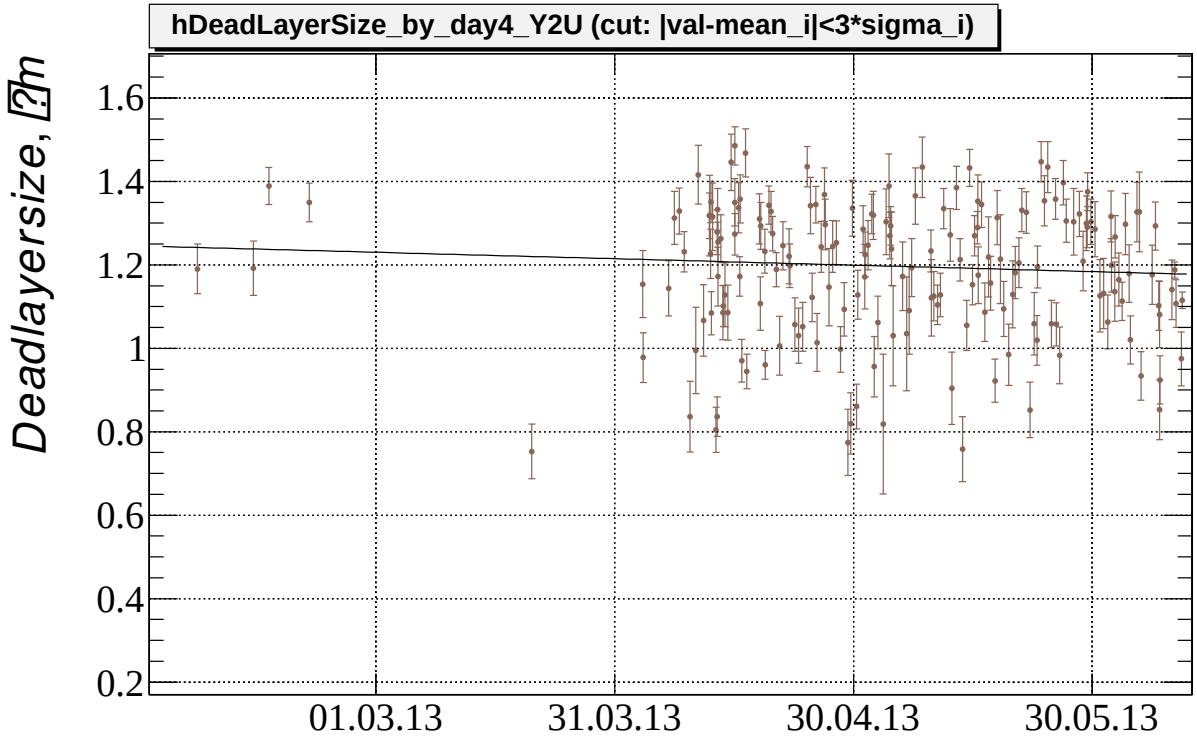


$Det3 : (-0.03 \pm 0.01) * t(Months) + (1.19 \pm 0.02)$?m

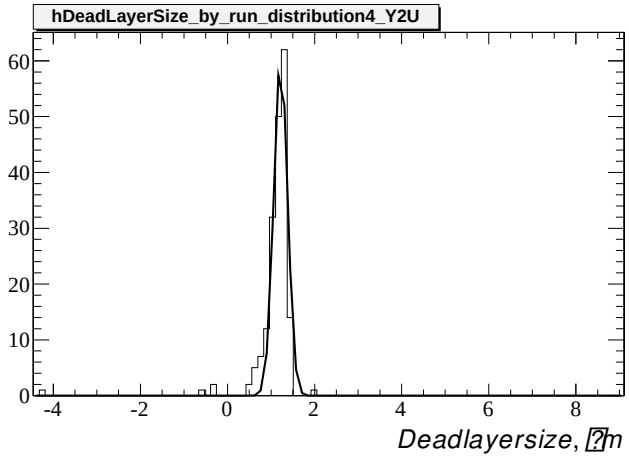


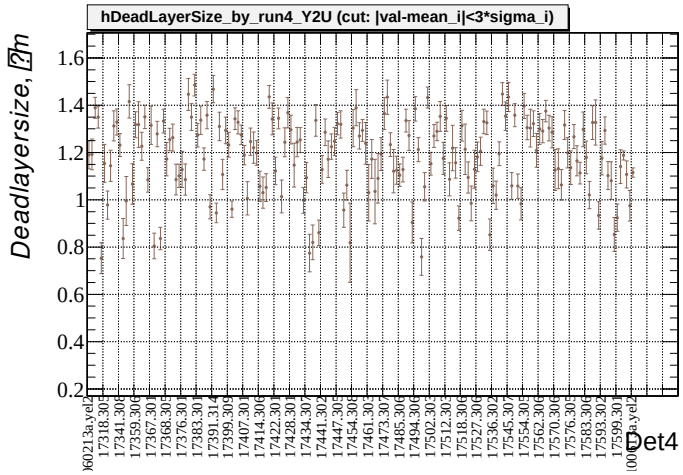


Dead layer size, Detector 4

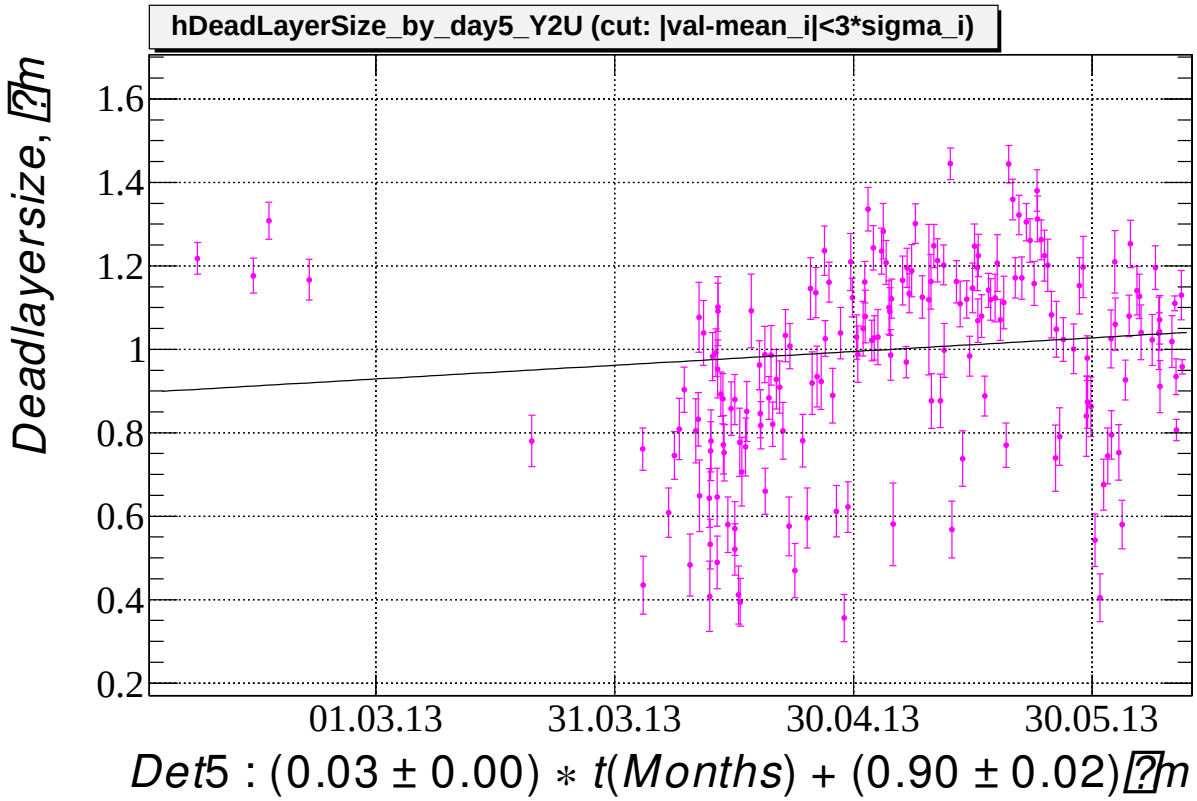


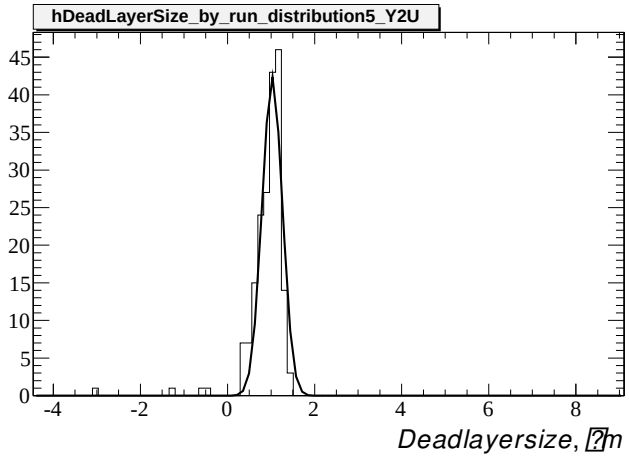
$Det4 : (-0.02 \pm 0.01) * t(Months) + (1.24 \pm 0.02)$?m

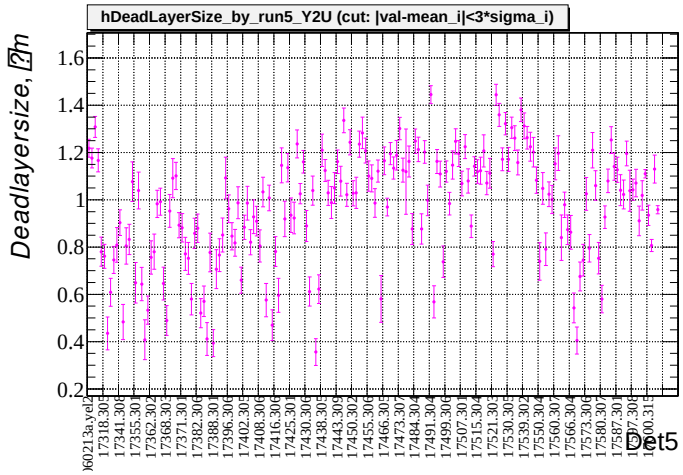




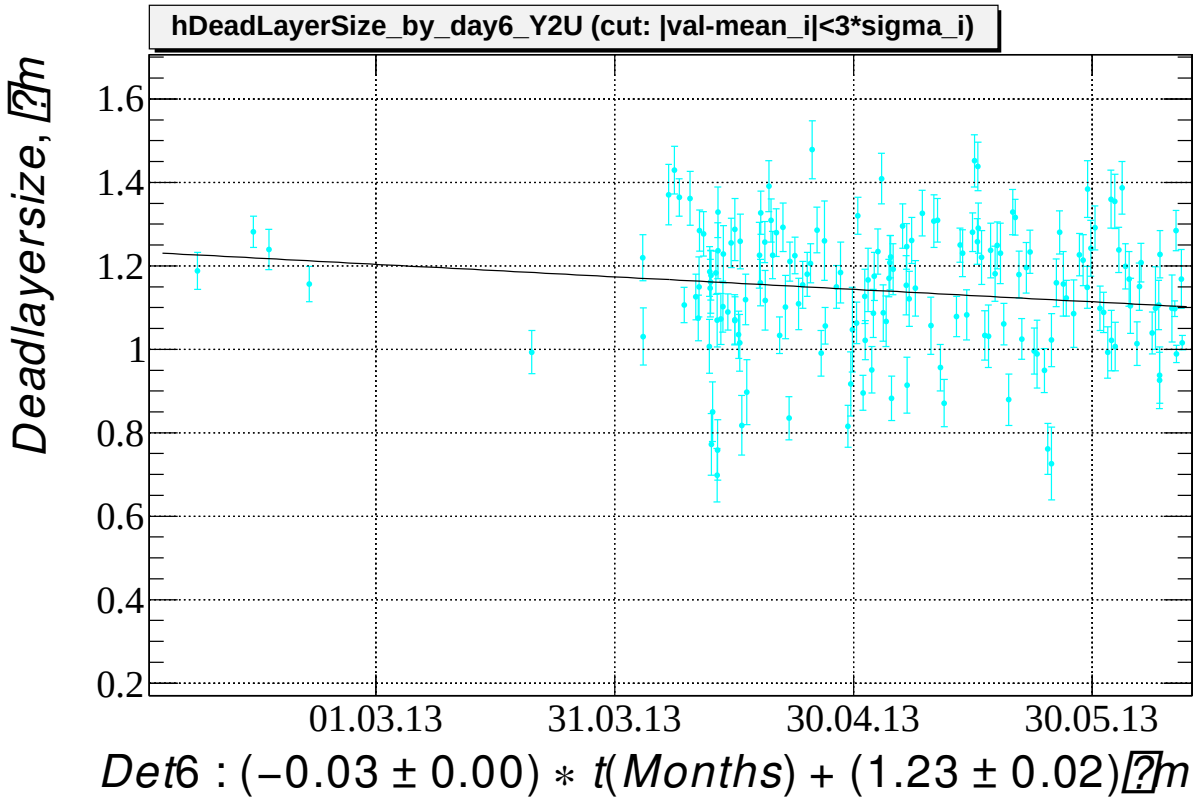
Dead layer size, Detector 5

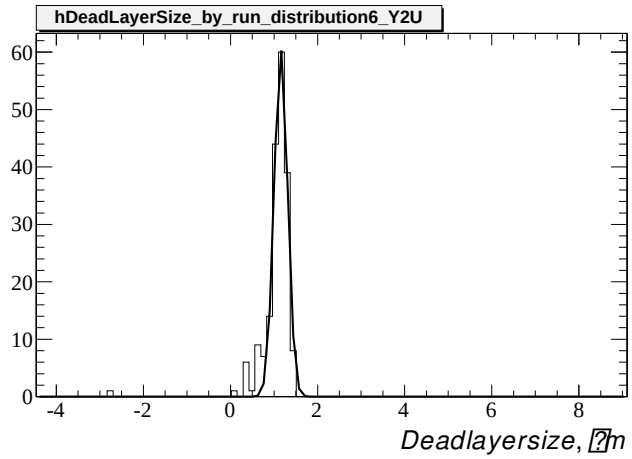


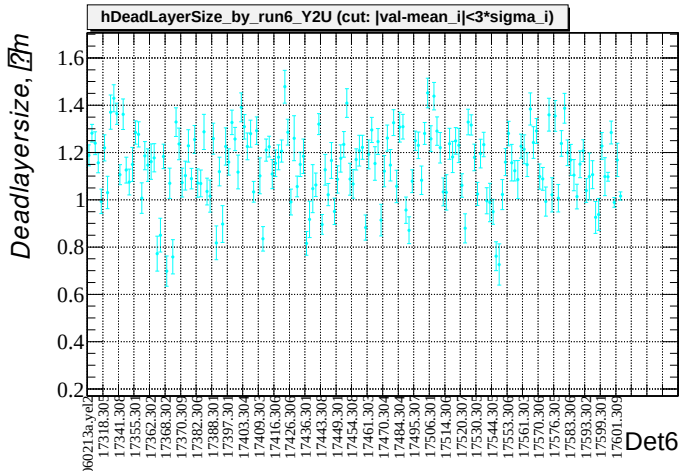




Dead layer size, Detector 6



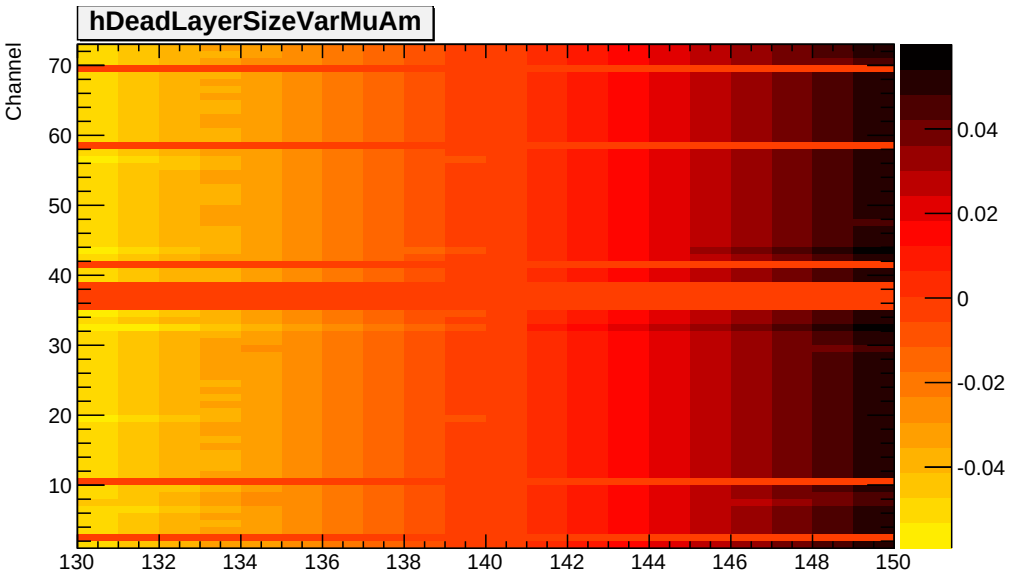


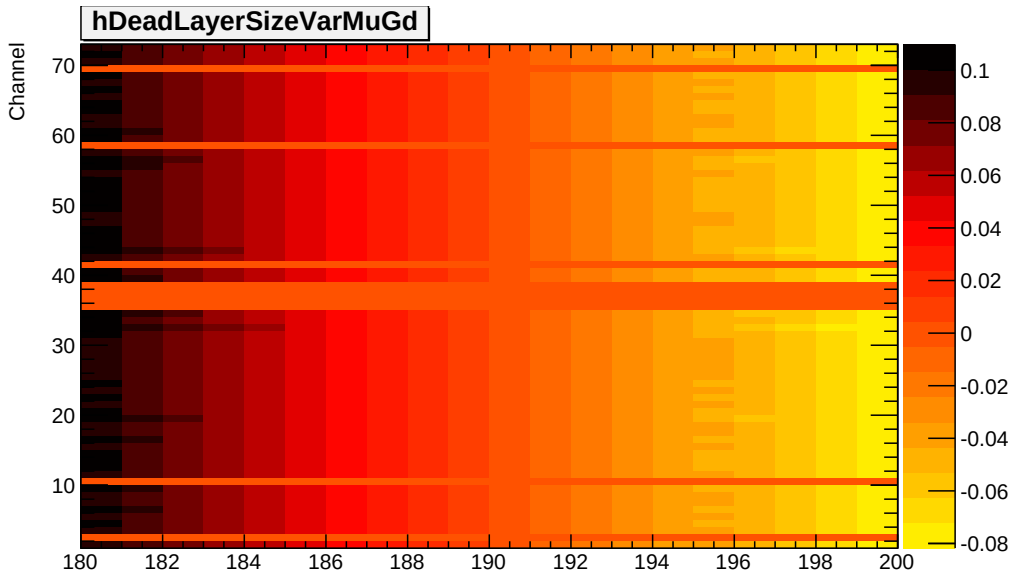


Dead layer size variation by λ_{Am}, λ_{Gd}

(run 17601.309.alpha0)

$$z(\widetilde{\lambda}_{Am}) = \frac{x(\widetilde{\lambda}_{Am}, \lambda_{Gd})}{x(\lambda_{Am}, \lambda_{Gd})} - 1, \quad z(\widetilde{\lambda}_{Gd}) = \frac{x(\lambda_{Am}, \widetilde{\lambda}_{Gd})}{x(\lambda_{Am}, \lambda_{Gd})} - 1 \qquad (8)$$





λ_{Am}, λ_{Gd} have the same values as before.