

Crystal cosmogenic background - update

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Status

Geometry: default UPoP

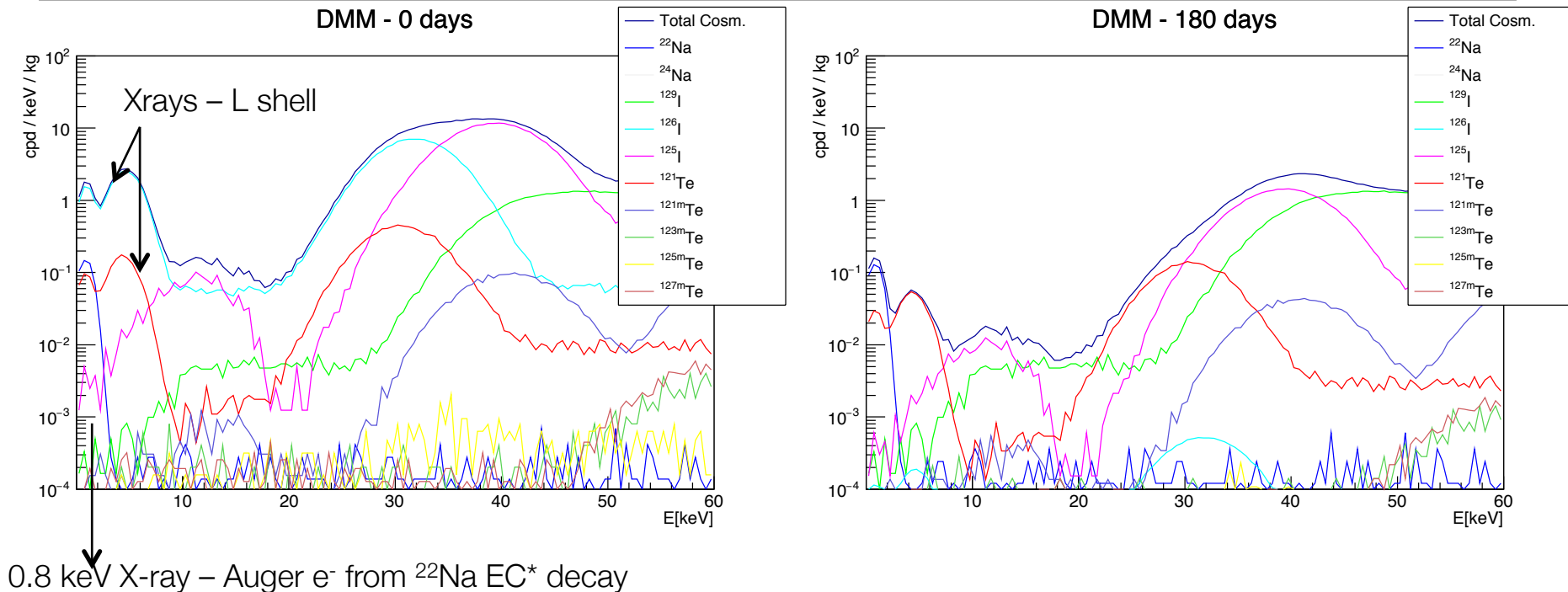
Crystal: diameter 4", length 8"

Crystal cosmogenic contaminations:

Completed simulations: Na²², Na²⁴, ¹²⁵I, ¹²⁶I, ¹²⁹I, ¹²¹Te, ^{121m}Te, ^{123m}Te, ^{125m}Te, ^{127m}Te, ¹¹³Sn

[Analysis ongoing, preliminary results available](#)

DMM – cosmogenic spectrum decomposition



All cosmogenic isotopes decay into stable elements except ^{121m}Te, producing ¹²¹Te, and ¹²⁵I, producing ^{125m}Te.

In the ROI background dominated by

- ¹²⁶I → fades in 1 month ($T_{1/2} = 13$ days)
- ¹²⁵I → fades in 6 month ($T_{1/2} = 59$ days)
- ¹²¹Te → $T_{1/2} = 17$ days but it is instead quite persistent since it is regenerated by the presence of ^{121m}Te ($T_{1/2} = 154$ days) which decays to the ground state with an IT probability of 0.886.
- ^{125m}Te spectrum still does not include the term due to ¹²⁵I decay

²²Na → its BG contribution becomes relevant below 2 keV. It does not fade away ($T_{1/2} = 2.6$ y)

DMM – background counts after 180 days underground

	T12	concentration / specific activity	Activity (Bq/kg)	VETO PMTs OFF 2-6 keV cpd/keV/kg	DMM cpd/keV/kg
121Te	17 d	110.0 cpd/kg	1.27e-03	2.91e-01	3.77e-02
22Na	2.6 y	8.00e-04 Bq/kg	8.00e-04	3.45e-02	2.06e-03
125I	59 d	621.8 cpd/kg	7.20e-03	1.48e-03	1.48e-03
129I	~stable	9.55e-04 Bq/kg	9.55e-04	3.92e-04	3.92e-04
126I	13 d	4.30e-03 Bq/kg	4.30e-03	2.08e-04	1.36e-04
121mTe	154 d	76.9 cpd/kg	8.90e-04	1.54e-04	6.84e-05
127mTe	107 d	32.1 cpd/kg	3.72e-04	4.50e-05	4.50e-05
123mTe	119 d	100.8 cpd/kg	1.17e-03	2.66e-05	1.77e-05
125mTe	57 d	79.1 cpd/kg	9.16e-04	2.25e-06	2.25e-06
24Na	15h	2.60e-07 Bq/kg	2.60e-07		0
Total				3.28e-01	4.19e-02

Dominated by ^{121}Te , followed by ^{22}Na
 Same order of magnitude of the BG due to ^{40}K !

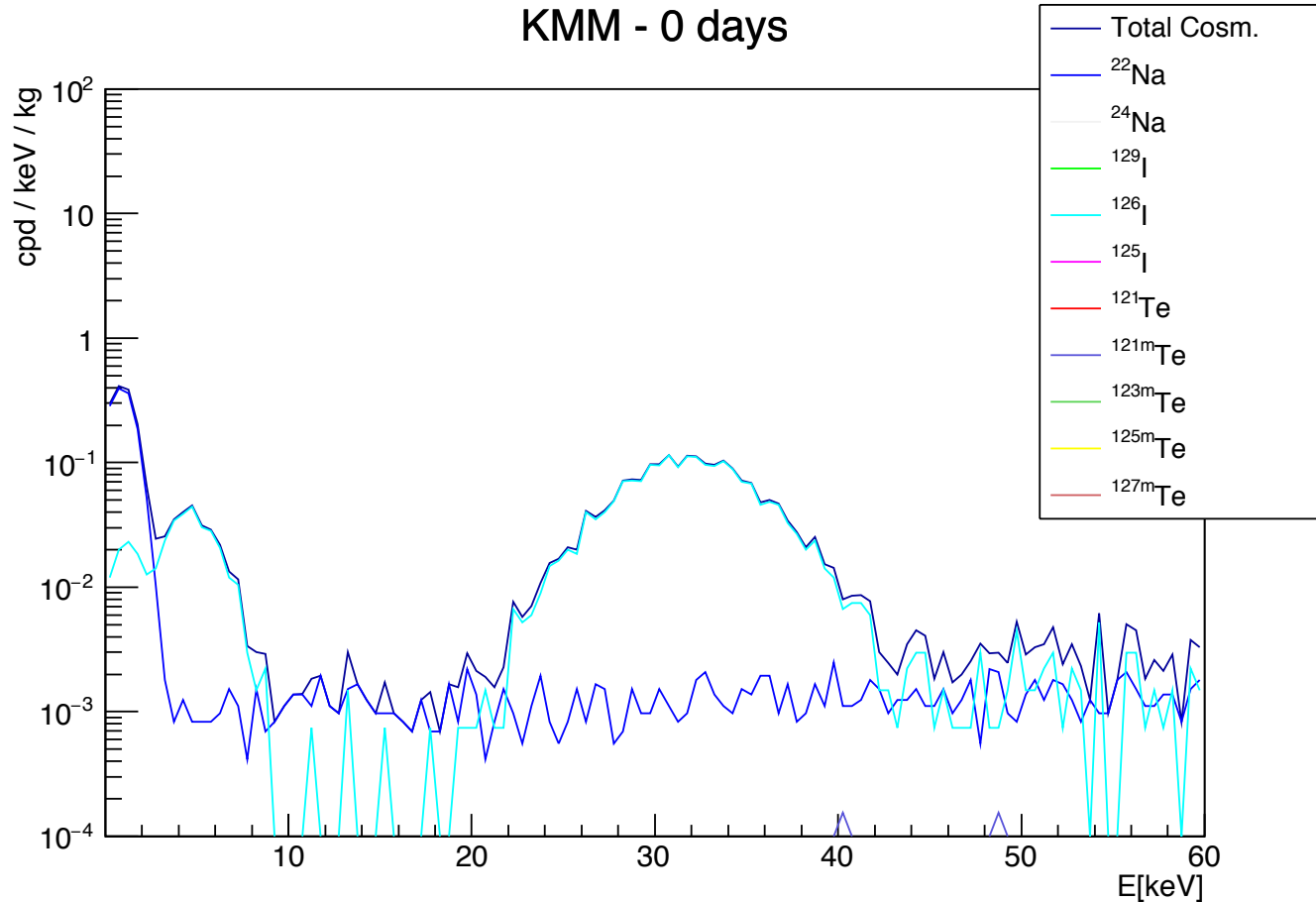
From DAMA NIM A 592 (2008) 297-315 (arXiv:0804.2738)

From ANAIS arXiv:1604.05587v1

Measurement by M.Laubenstein for PU.
 LNGS GeMPI2 detector NaI random powder from Aldrich APL (AAPL)
 Cat No 40928-6, batch no 173-02, UHP, 4.694 kg

Preliminary

KMM – background counts



BG contribution only comes from ^{126}I and ^{22}Na for a total of $3.75 \cdot 10^{-2}$ cpd/ keV/ kg
(and ^{126}I fading away in 1 month)

^{40}K counts in KMM are $1.90 \cdot 10^{-1}$ cpd/ keV/ kg