Update on the background estimate and veto studies

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SABRE

Outlook

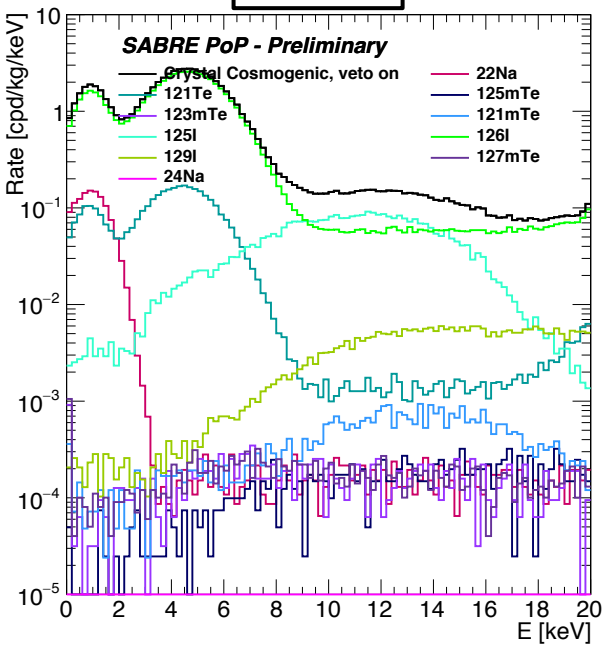
- Cosmogenic activation
- Background measurements in the PoP phase
- CIS effect on veto efficiency

Cosmic activation

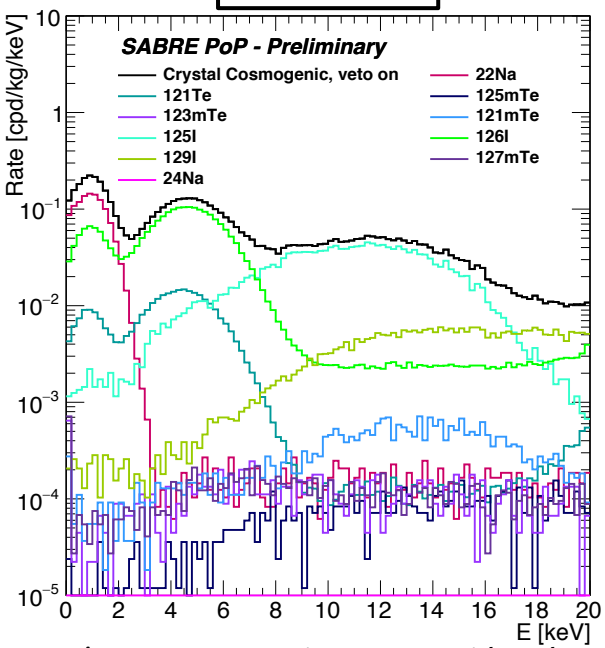
Isotope	Half-life	Comment
^{22}Na	2.602 y	Peaks at 1-2 keV
^{121}Te	16.78 d	Peaks at 3-7 keV
^{121m}Te	154 d	Regenerates ^{121}Te
^{125}I	59.40 d	Dominant above 7 keV
^{126}I	12.93 d	Disappears quickly

- Neutron rate 440 times higher at 12 km then surface**
- 1 day flight ~ 1 year surface in exposure
- 8.8 half-lives to reduce the contaminations to 1 day of surface exposure

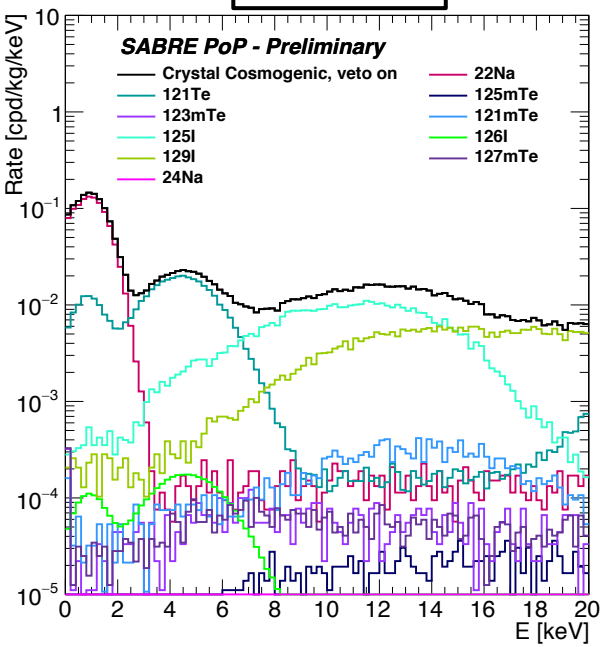
0 days



60 days*



180 days



*121Te regeneration not considered

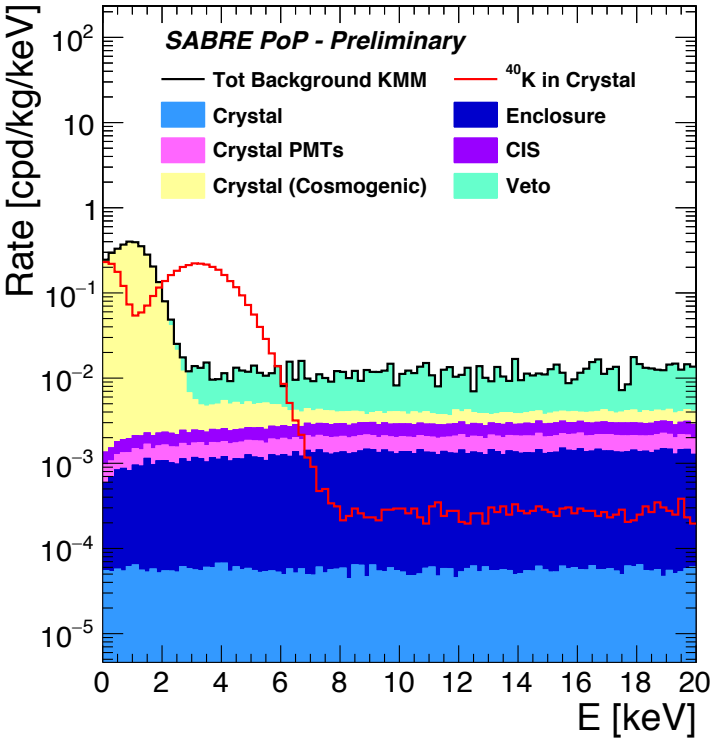
** calculated with http://www.seutest.com/cgi-bin/FluxCalculator.cgi using Melbourne's coordinates

PoP SENSITIVITY

- The PoP phase allows the measurement of the crystal contaminations
- What is the precision expected?

E(Scintillator) ∈ [1280,1640] keV, E(Crystal) ∈ [2,4] keV

40K measurement mode



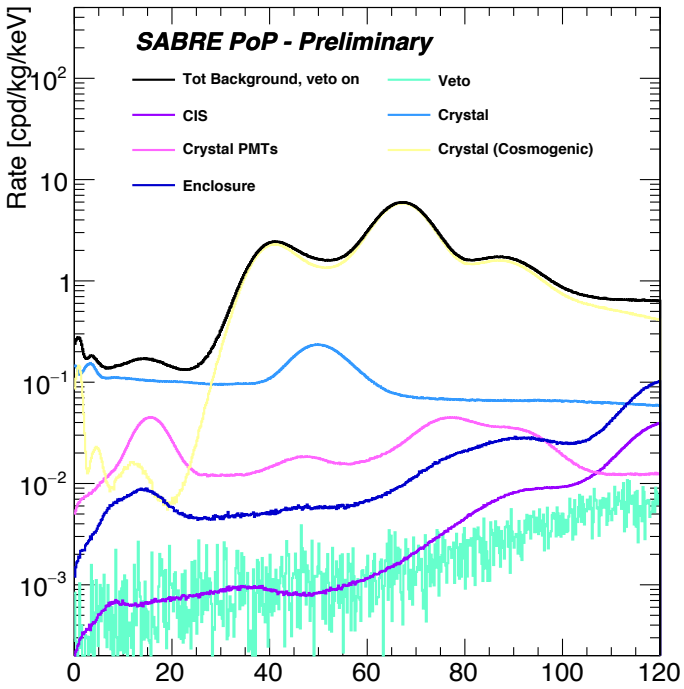
Isotope	Expected rate [cpd/kg/keV]
^{40}K in Crystal	1.91E-01
Crystal (other radiogenic)	5.85E-05
Crystal (cosmogenic 60 days)	4.13E-02
Crystal PMTs	5.78E-04
Enclosure	1.14E-03
CIS	9.70E-04
Veto	6.27E-03
Total background	5.1 E-02

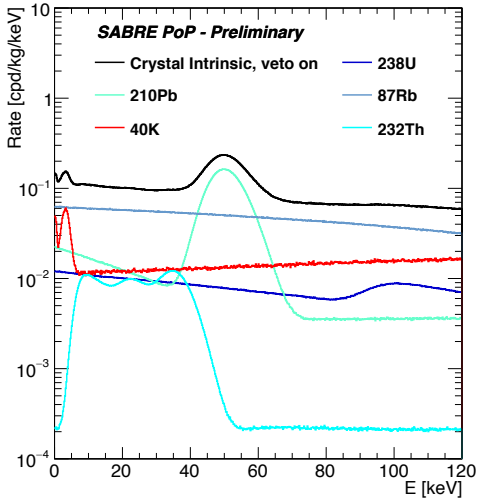
After 90 days:
S=172, B=46
SQRT(S+B)/S=8.6%
equivalent to 0.86 ppb of ^{40}K

Can do a template fit to data to measure ^{40}K and (if enough low energy sensitivity) ^{22}Na

Can we measure other contaminations?

Intrinsic Backgrounds

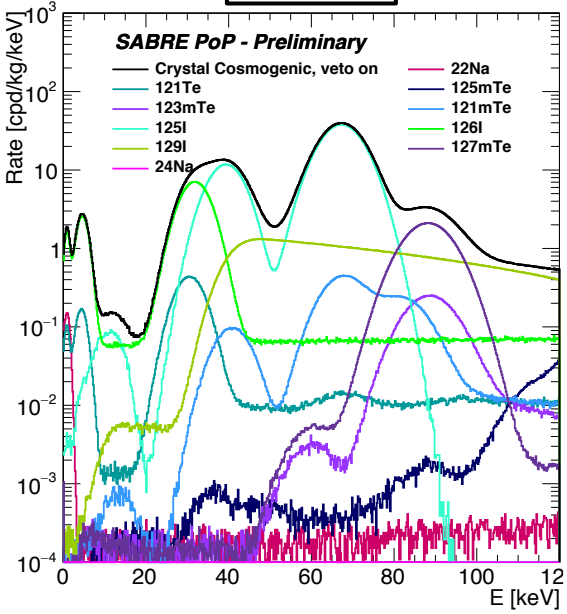




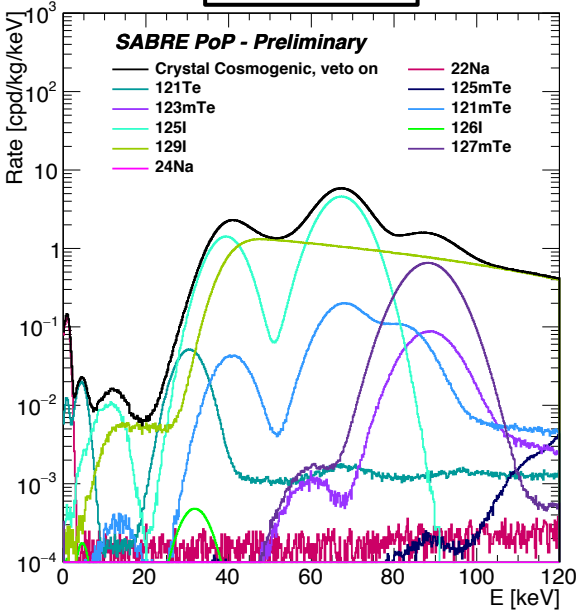
- Cosmogenic background dominates the higher energies
- ^{210}Pb could be measured at the 46 keV peak which contrast the well in the cosmogenic background (resolution important)
- ^{87}Rb gives exponential falling background, probably hard to measure
- U and Th too small

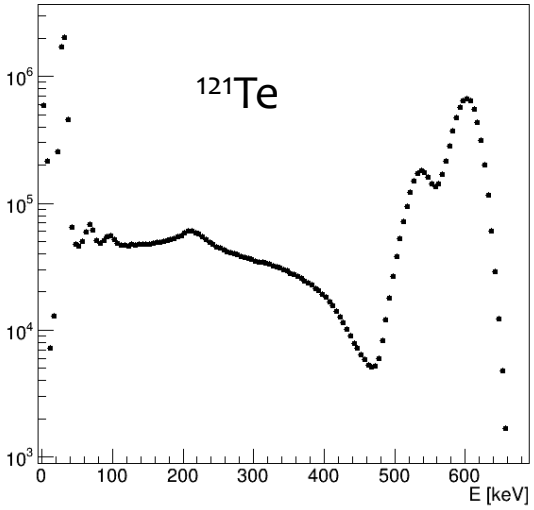
Cosmogenic Backgrounds

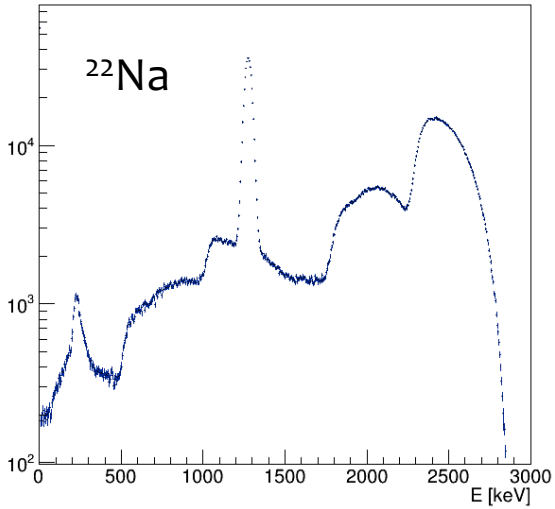
0 days



180 days



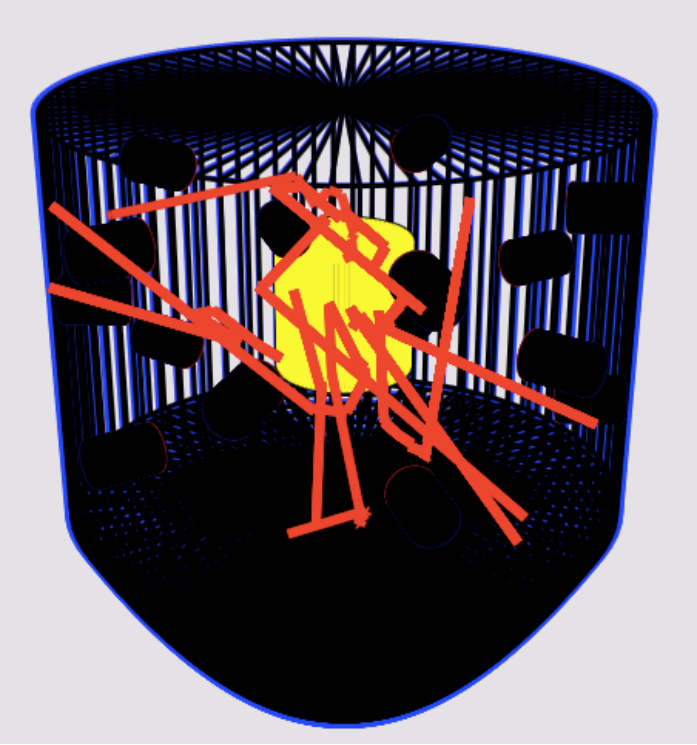


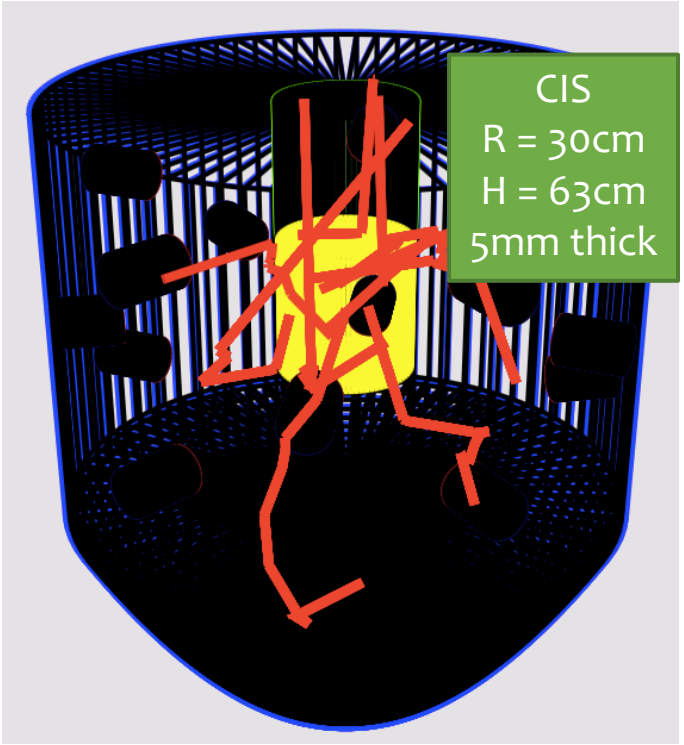


- ^{125}I from the double peak at 30 keV and 70 keV
- ^{121}Te and ^{22}Na from higher energy bands

Insertion system

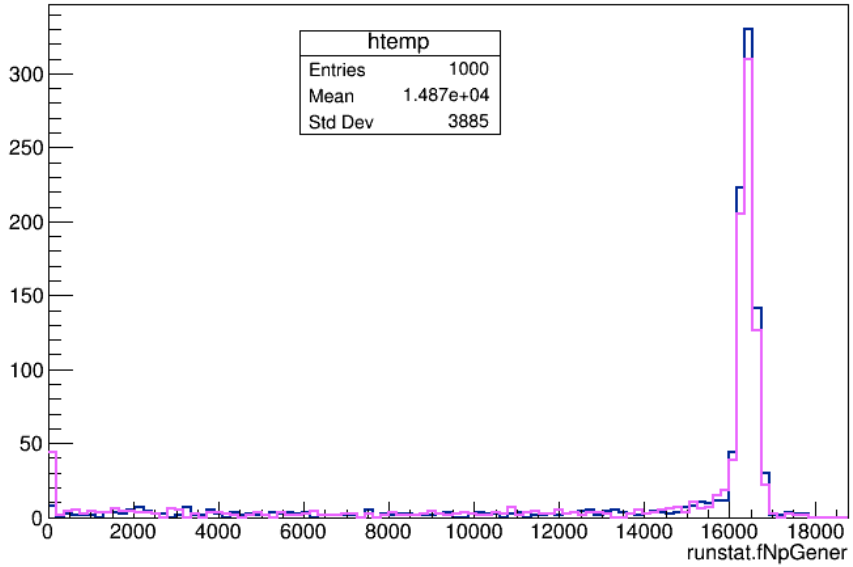
- Is the dead volume of the CIS significantly reducing the veto efficiency?
- Compared solution with/without CIS



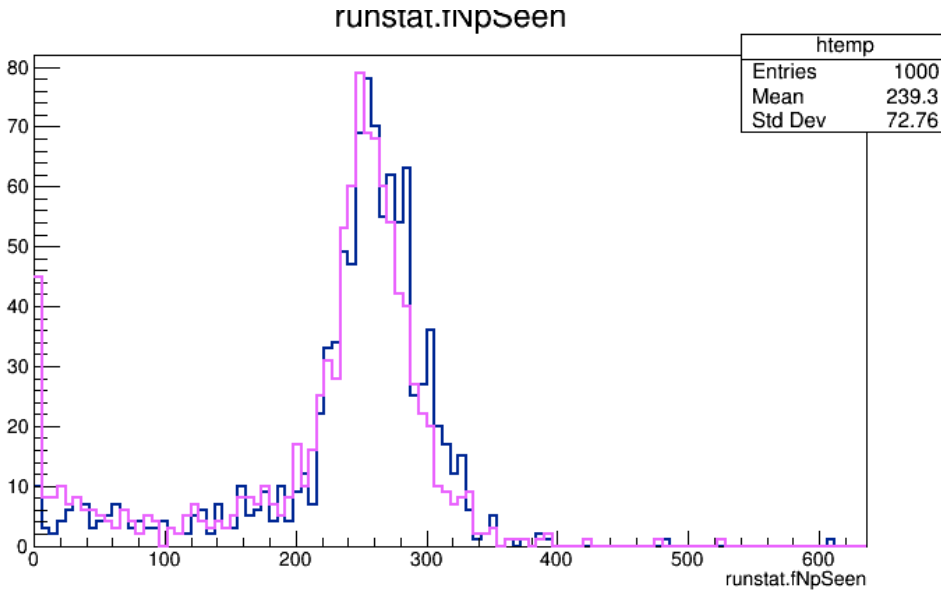


Light yields

Generated photons



Obeserved photons



Backup