# n from surface contamination 100 mBq/m3 update

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# Context

Good:

TPCs have stronger surface background rejection capabilities than single phase detectors. The only radiation from the surface giving a WIMP-like signal are neutrons.

Bad:

Very large TPCs have different potential channels of random coincidences producing WIMP-like signals.

# Context

This study considers only the neutron production induced by (a,n) from Rn daughters, namely Po-210 (150 d) after Pb-210 (22 y).

Only the total surface of acrylic considered for reference. each surface of the detector can contribute in a similar way, depending on the Adsorption of Pb by the surface.

# Time evolution of activity

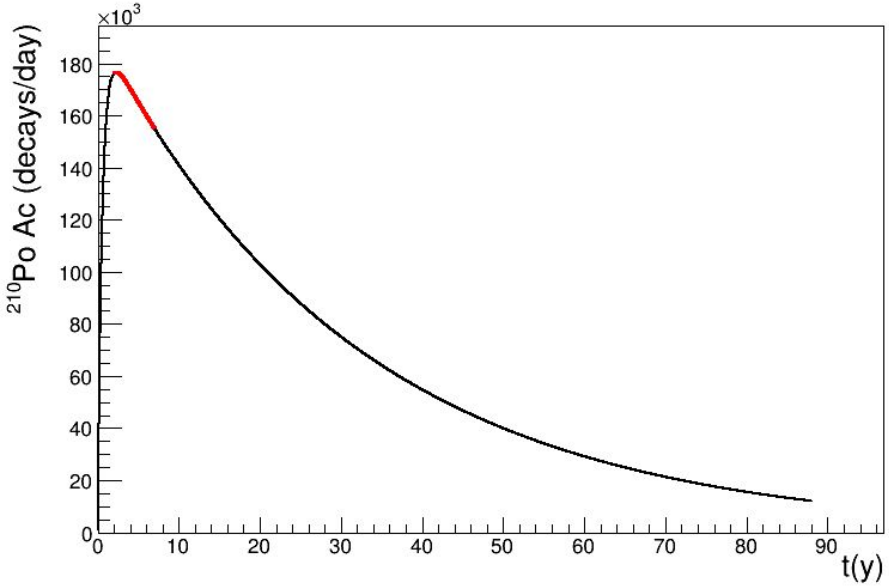
For an exposition of one day,

Plate-out rates measured at SNOLAB (arXiV 1708.09476): 249 atoms/cm2/day.

**VERY VARIABLE**

880 m2 of acrylic surface.

Peak of activity 2.3 y after exposure.



# Integrated activity

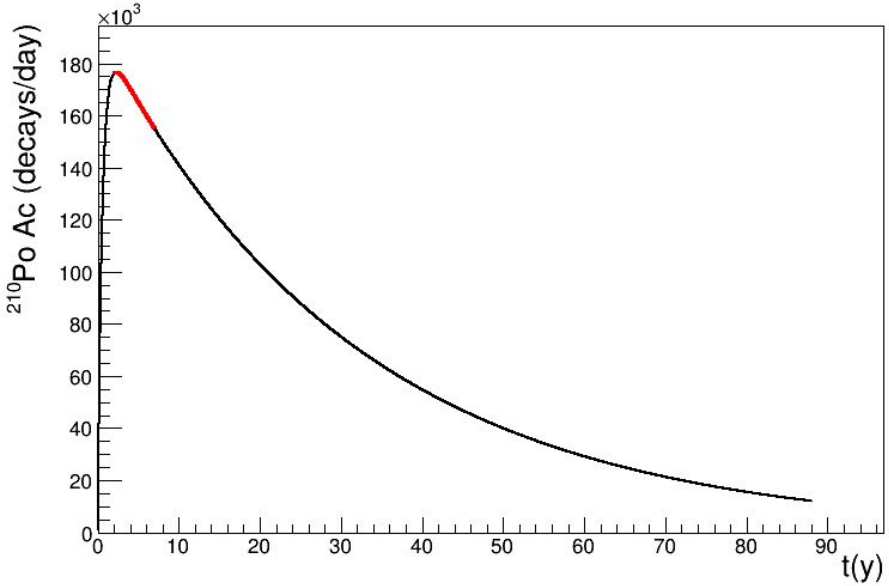
For an exposition of one day,

Number of Pb-210 nuclei plated= 2.2e+09

Integrated activity (88 y) = 2.06004e+09

Ratio of decays in 5 years = 0.148247 -> 3.05e8 decays

Ratio of decays in 10 years = 0.275325 -> 5.67e8 decays



# Integrated activity

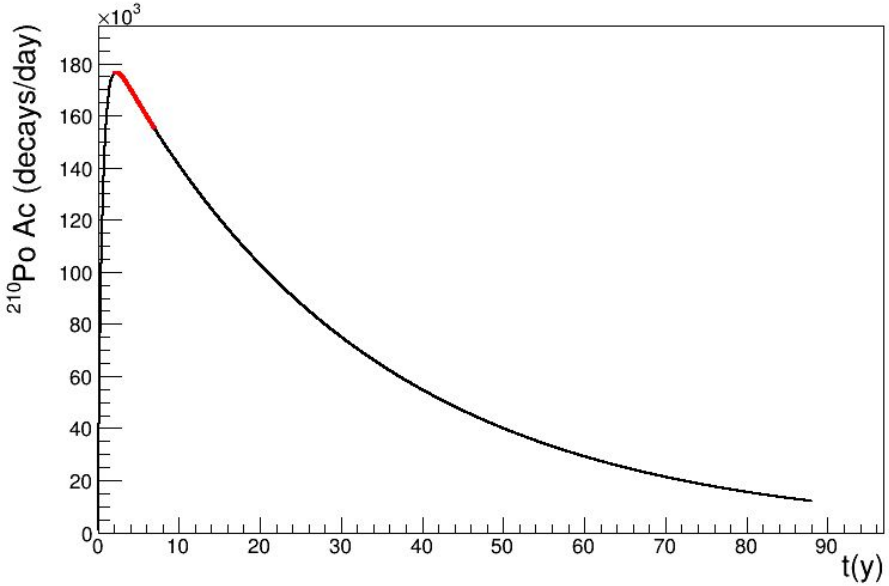
For an exposition of one day,

Ratio of decays in 5 years = 0.148247 -> 3.05e8 decays

Ratio of decays in 10 years = 0.275325 -> 5.67e8 decays

Neutrons produced in 10 years = 68.0618

**After cuts = 3.94759e-05**



# Integrated activity

In 270 days of exposure:

n from surface = n from bulk

This is considering Donchamp first acrylic, not super great.

Better acrylic, less exposure would equal the bulk level.

Exposures of few days, would mean no cleaning of, at least, the veto.

# Integrated activity

In 180 days of exposure at 100 mBq/m3 (instead of 135 Bq/m3):

A factor 1000 less than bulk contamination.

With those numbers it is safe to say that the veto would induce no relevant activity in terms of (a,n).

The effect of this contamination on veto tagging efficiency is **not** studied here.