Material activation above ground

Cosmogenic activation in massive components has been studied as a source of β/γ **background** to assess its contribution and decide about exposure restrictions

Production rate R → Activity A → Counting rates in TPC and Veto (G4DS)

➔ Manuscript for possible publication prepared and sent to Editorial Board:
https://darkside-docdb.fnal.gov/cgi-bin/private/ShowDocument?docid=4773

- For **copper** (875 kg) and **stainless steel** (225 t): activity of relevant products has been evaluated for conservative exposure times finding no significant contribution

  - Copper: all activities <1 Bq, even for 10 y
  - Stainless steel: some activities like that of ^{54}**Mn** at ~100 Bq, just for 1 y, but checked to have negligible effect on counting rates

- For **titanium** (9.5 t): ^{46}**Sc** (half-life 84 days) found to be a relevant product, new calculation of saturation activity as A = (3.14 ± 0.79) mBq/kg producing 30 Bq

  → considered in background model

- For **UAr**: activation has been computed for ^{39}**Ar,** ^{37}**Ar** and ^{3}**H** from measured production rates and a new estimate for tritium R = (168 ± 53) kg^{-1}d^{-1} assuming exposure conditions as realistic as possible from Urania to LNGS for the production of 120 t

- For **UAr**: activity A in mBq/kg when all UAr is in Gran Sasso

^{39}Ar	0.0207±0.0015
^{37}Ar	0.1030±0.0086
^{3}H (no purification)	0.076±0.012
^{3}H (purification at Aria)	0.00297±0.00094

A residual level of 2.8% of quantified activity of ^{39}Ar in DarkSide-50 is confirmed

^{37}Ar will decay fast

Purification reduces activity of ^{3}H by a factor 25

Counting rates in DarkSide-20k

From the full set of detector components to estimate rates in the TPC (50 t) and in the Veto (32 t) from measured activities

	TPC rate (Hz)	Veto rate (Hz)
Gamma	52	135
Beta	36	26
Total	88	161
^{39}Ar:	1.0	0.66
^{37}Ar:	5.1	3.3
^{3}H:	0.15	0.09

γ: including ^{46}Sc in Ti giving 0.4 and 25 Hz
β: measured ^{39}Ar activity in DarkSide-50

From estimated cosmogenic activation in UAr