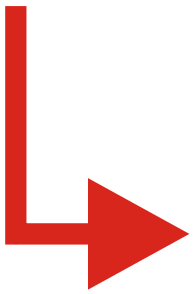
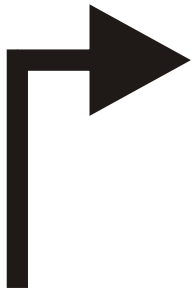
# Preliminary Background Report

**GOAL: $10^{-3}$ /kg/y/keV**



**for a 100 kg y exposure**

**Individual contributions have to be well below $10^{-4}$ /kg/y/keV =. gbu**



**We have more then 10 sources of background!**

Viele Hunde sind des Hasen Tod!

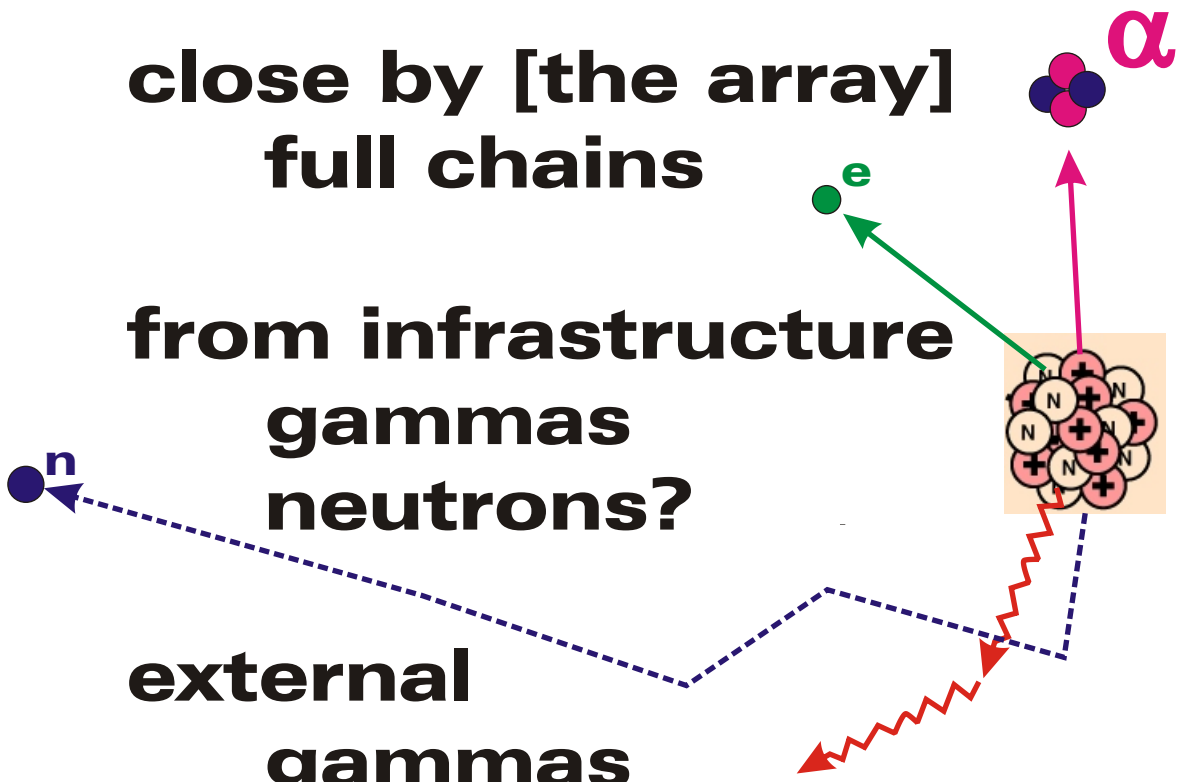
# Background Sources

## Radioactive

close by [the array]
full chains

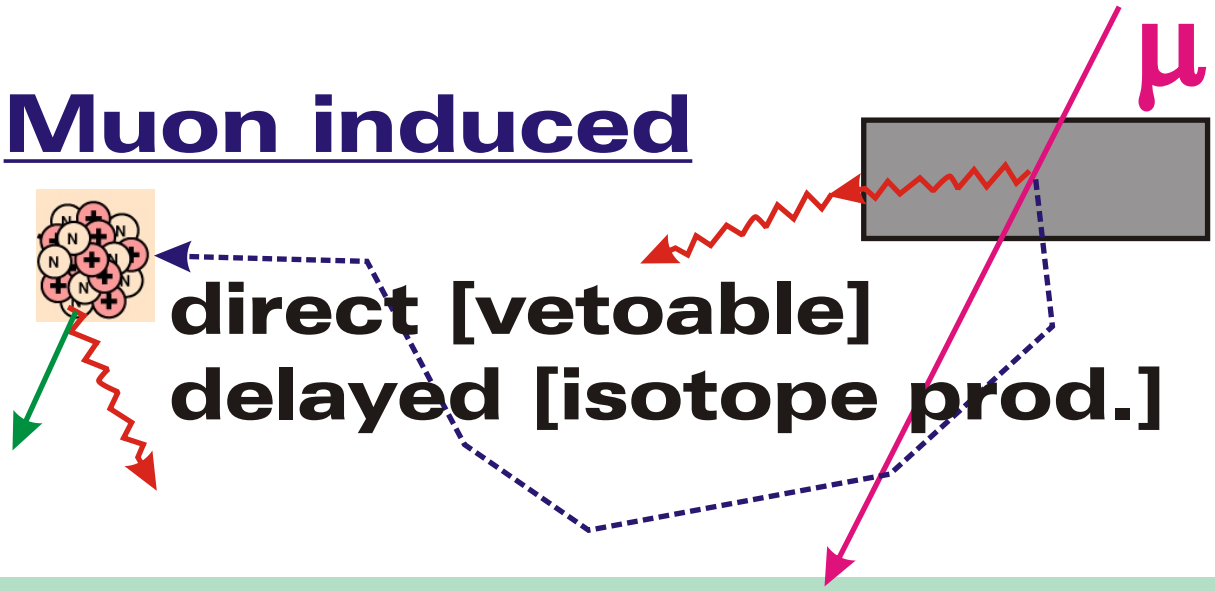
from infrastructure
gammas
neutrons?

external
gammas
neutrons




## Muon induced

direct [vetoable]
delayed [isotope prod.]



# Deals and Limitations

## Let's divide it up:

5 gbu for things close by

5 gbu for infrastructure and external

## Let's face it:

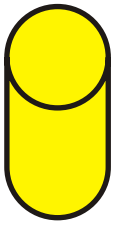
If it screens against gammas, it probably produces neutrons.

We have a great MC, but we have to use it properly!

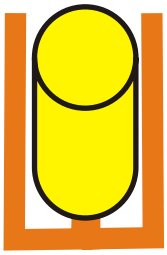
## Never Assume...

# Background Sources

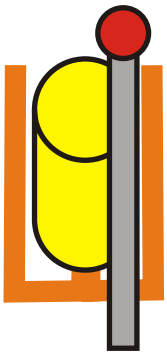
## close by radioactivity :



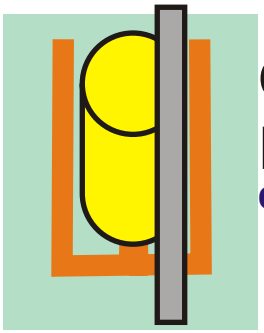
| | | PI | PII |
|---|---|---|---|
| **Detectors :** Supression PII/PI 20 for Co 10 for Ge | Co: | 150[840] | 0.4[40] |
| | | 35[200/270] | |
| | Ge: | 8 | 13 [y1] |
| | | | 5 [y2] |



| | | | |
|---|---|---|---|
| **Suspension** | Cu: | 15* | 4 |
| | $CF_n$: | 25* | 8 |



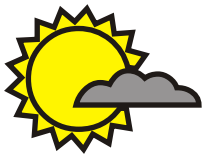
| | | | |
|---|---|---|---|
| **Cabling** 20g, 1mBq/kg per detector | | | 6 |
| **Electronics** 10g, 100mBq/kg 35cm above string | | 6 | 3 |
| | | 5 | 2 |



| | | | |
|---|---|---|---|
| **Cryogenic Liquid** 0.5μ Bq Rn , 22Na | | 1 | 1 |
| | | <1 | <1 |

*MC based extrapolation

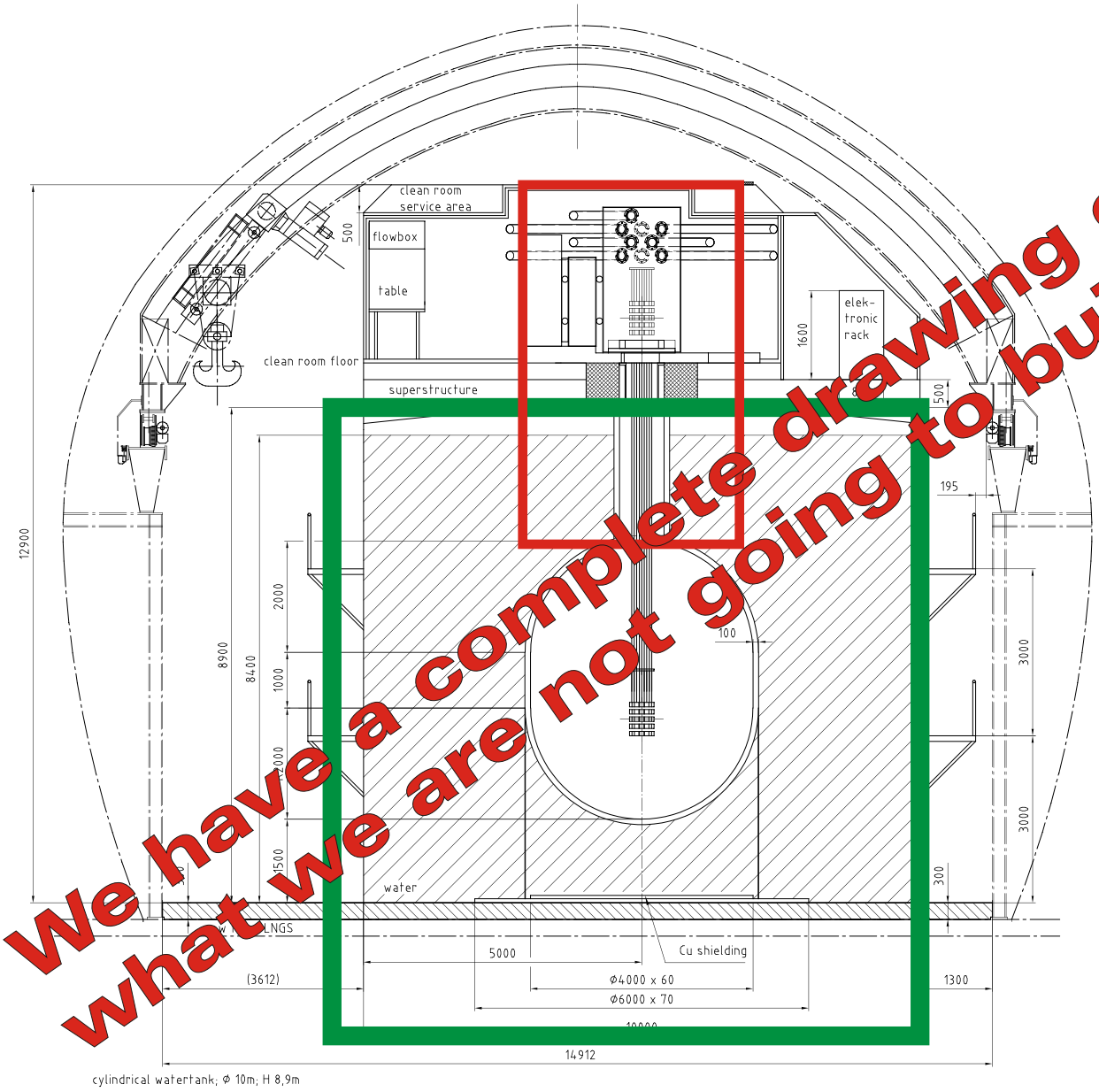
**We are not there!**



**Can be worked on after we started!**

# Background Sources

## Everything not close by:




We have a complete drawing of what we are not going to build

**The MC uses a simplified geometry.**
**For some critical issues input is urgently needed.**

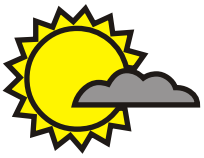
# Background Sources

## Infrastructure/external:

| | Nitrogen | Argon |
|---|---|---|
| **Cu tank[25mBq/kg]** | | |
| P I | 2.0 | 0.1 |
| P II | 0.7 | 0.03 |
| **Steel neck[20mBq/kg]** | | |
| P I | 0.6 | 0.03 |
| **Superinsulation [38kg][5mBq/kg]** | | |
| P I | 1.3 | |
| P II | 0.4 | 0.02 |
| **Water[10μBq/kg]** | | |
| P II | 0.2 | 0.01 |
| **External through tanks** | | |
| P I | 4.2 | |
| **External through open neck** | | |
| P I | [240] | 9 |
| [P I/P II=3] | 2.4 [10cmPb] | |
| P I | 11.1 /20 | 0.6 |
| P II | 2.9 /20 | 0.2 |

pads → new

$^{208}$Tl only ⇒ 20% more from $^{214}$Bi



**3.5 gbu is close.**

**Will have to be redone for new Infrastructure.**

**Add contribution from top.**

# Summary

| | Phase I | Phase II |
|---|---|---|
| Array | 200 | 27 |
| Infrastr. | 13 | 4 |
| /External | 0.8 | 0.3 |
| Muon prompt | 1 | 1 |
| | 1 | 1 |
| Muon delayed | 1 | 0.6 |
| [10cm Pb] | 9 | 6 |

**Neither Nitrogen nor Argon provide a design with margin.**

**The top infrastructure and 3rd wall are not accounted for.**

**Radon Emanation and Surfaces are ignored.**

# Conclusions

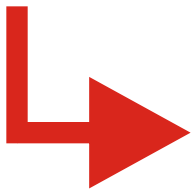
**We have to work on the Array!**

**The background index has to be reduced by a factor 4~5.**

**The old design for the infrastructure does not have any "background margin"!**

**The MC has to get input and seriously be used as a tool.**

**Argon produces background that scales with $^{76}$Ge enrichment.**



**Nitrogen is better**

In an ideal world.....

# Ideal World

Well, a better world.....

**Larger Nitrogen volume**

**Plug instead of neck**

**More space**

**Deeper underground**