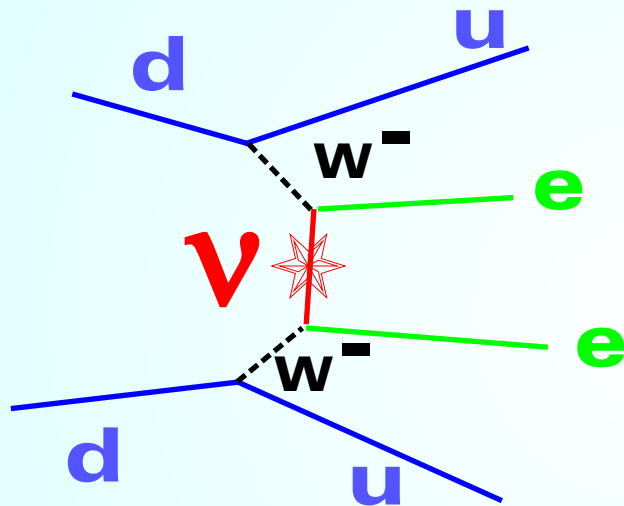


Simulation for the

Ge 1 ton Challenge/ Madness

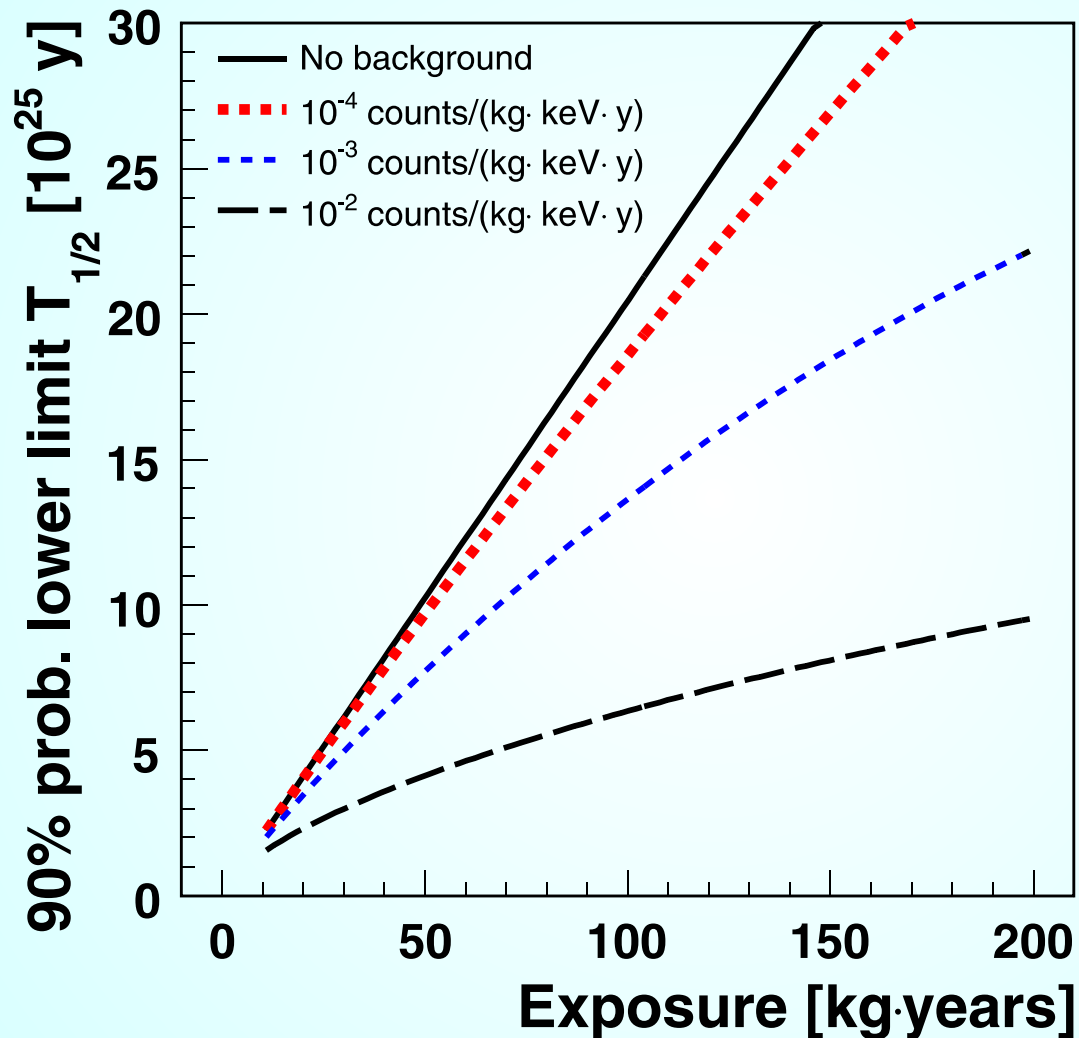


Some Remarks

München, 19.1.2010
I.Abt, MPI München

probably useless

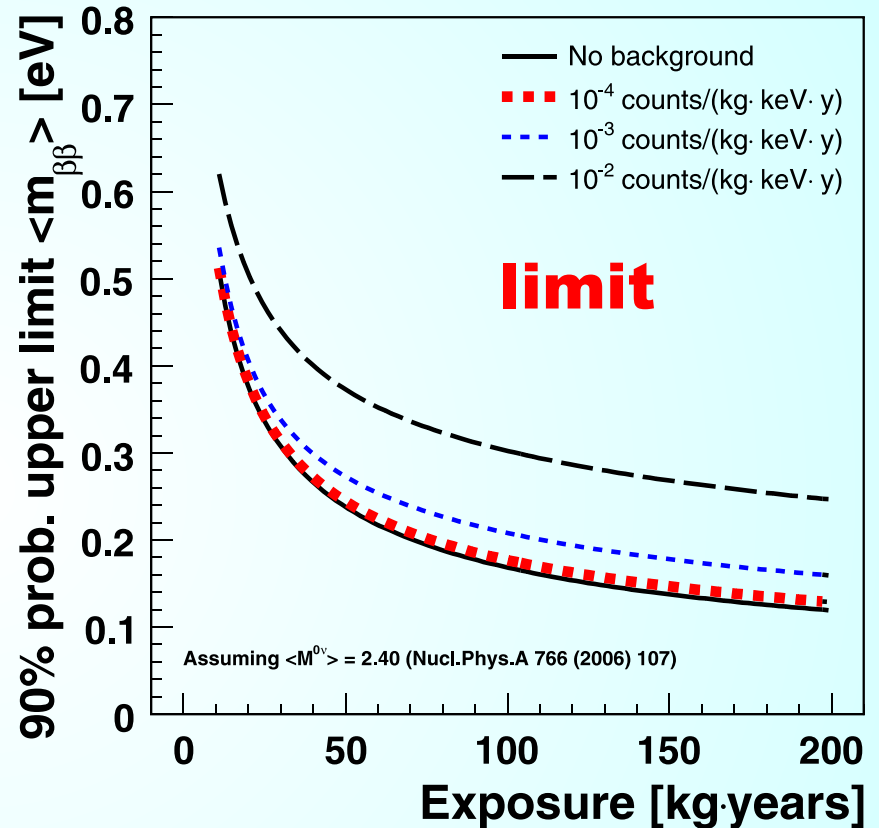
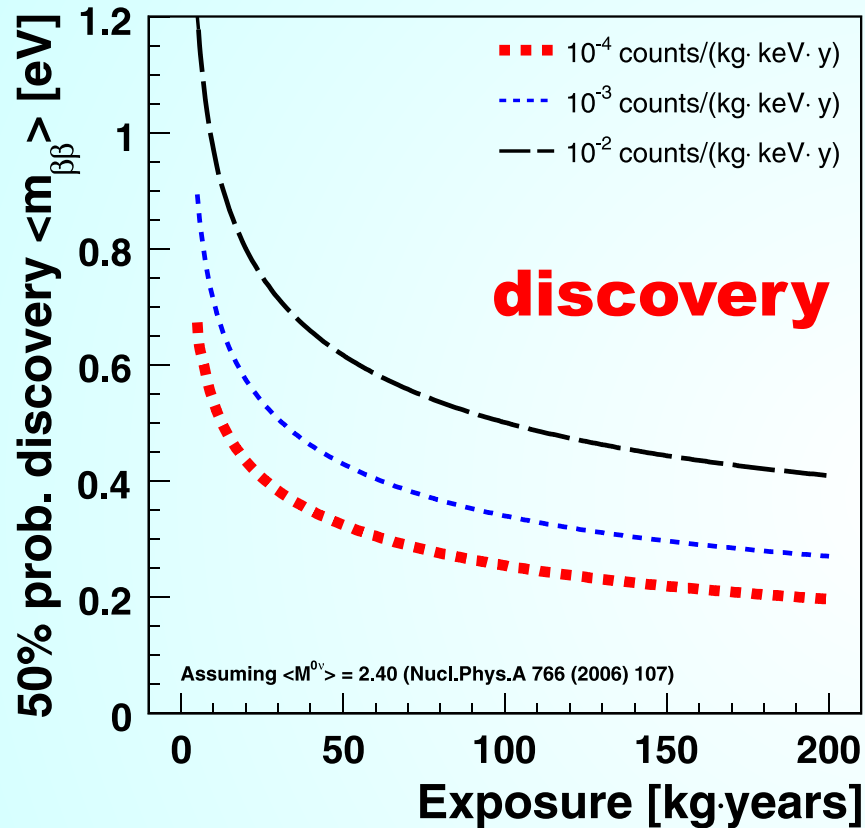
It is all in the Background



Exposure larger than 100 kg year is wasted for background of 10^{-3} / (kg keV y)

Need to simulate the truly rare event.

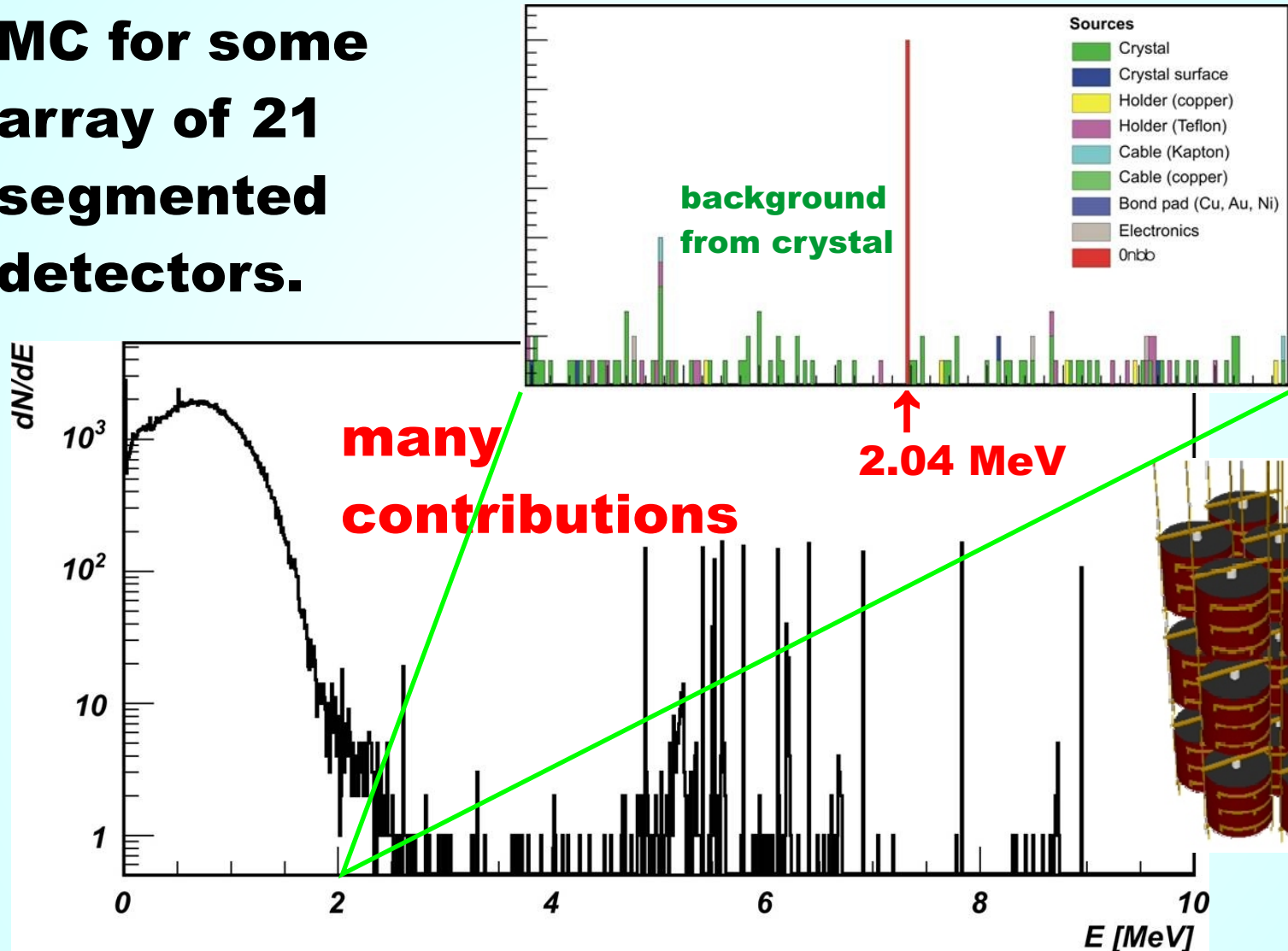
Importance of Background



You need below 10^{-4} to reach 10meV to exclude inverted hierarchy.
You need to simulate the extremely rare event.

Example

MC for some
array of 21
segmented
detectors.

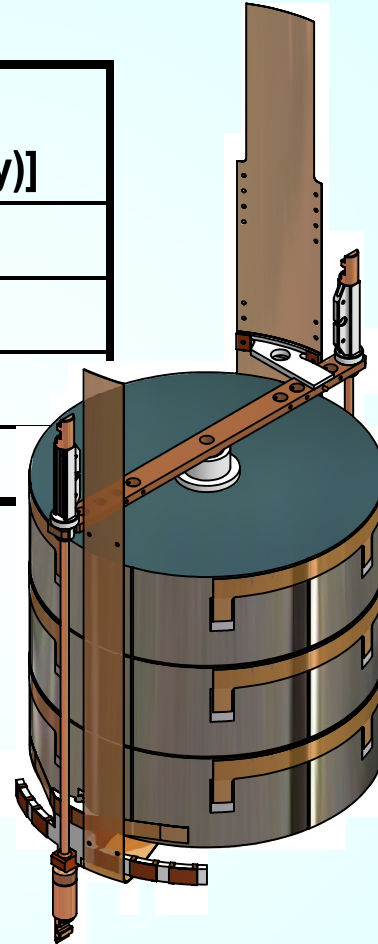


Need to focus

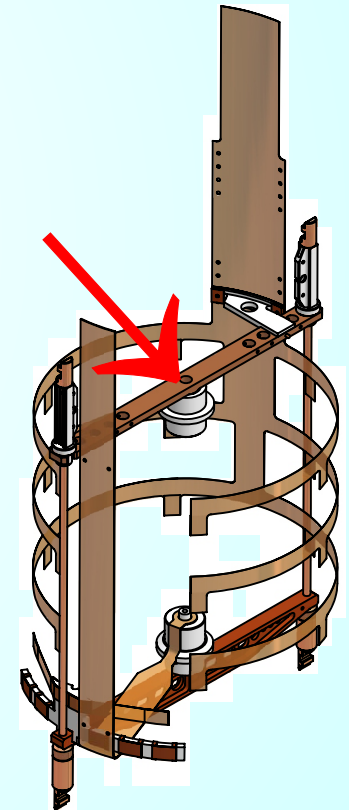
| Part | Background index [10^{-4} counts/(kg·keV·y)] |
|------------------------|--|
| Crystal | 5 |
| Holder (copper) | 4 |
| Holder (Teflon) | 8 |
| Cabling | 6 |

 **Something will
have to touch
and hold.**

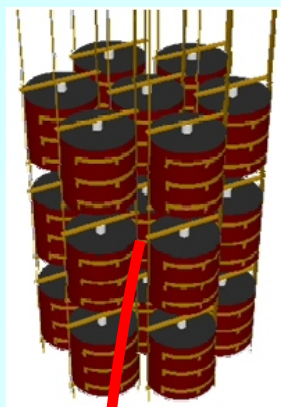
**We need to focus on
key elements of any system.**



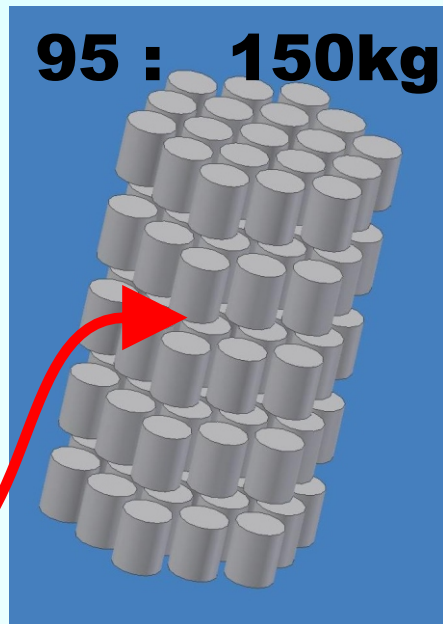
**18-fold
segmented
detectors**



Example



21 : 34kg



95 : 150kg

And we have to check scaling.

The inner part of the large array should behave like the center crystal of the small array.

Simulate Thorium chain for the insulators that touch.

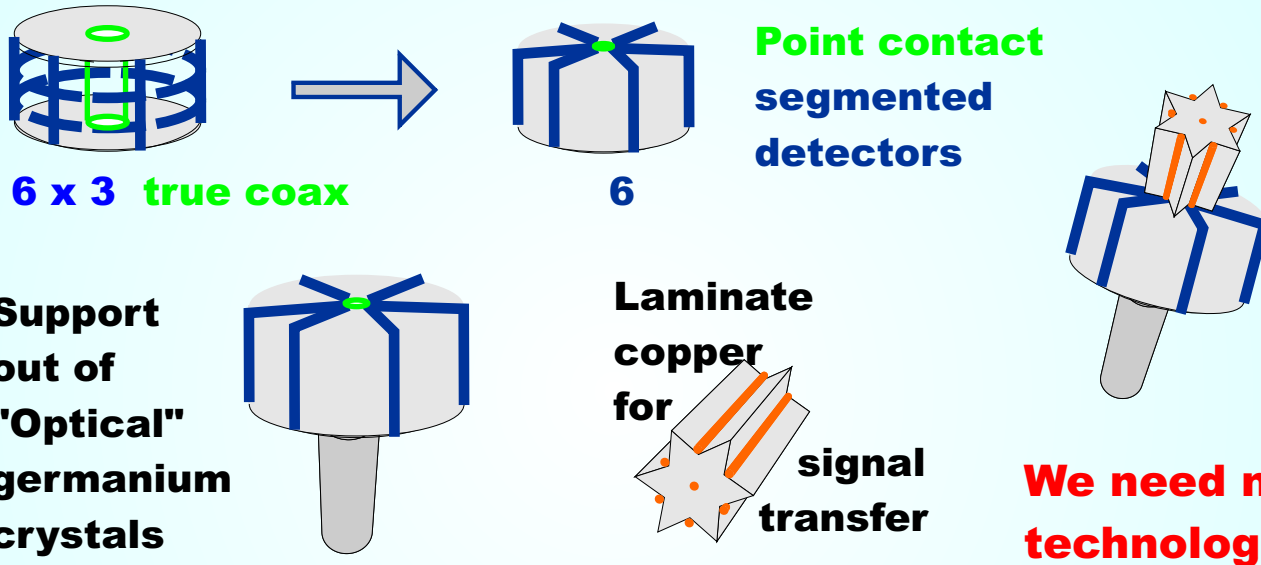
21 Million decays: survival prob. $0.0002 \pm 8\%$.

A 1t array requires 625 detectors \Rightarrow 625 M decays.

**Assume 1g insulator / detector \Rightarrow $50\mu\text{Bq/kg}$ for 10^{-5}
without segmentation \Rightarrow $10\mu\text{Bq/kg}$**

Array of the Future

Path to 1 ton is not clear at all. **Need $< 10^{-4}$ bgr.**

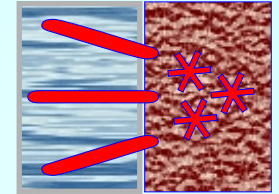


We need MC to guide new technology. We need to simulate every configuration with a lot of statistics and with correct tails of distributions.

↳ We need bench marks.

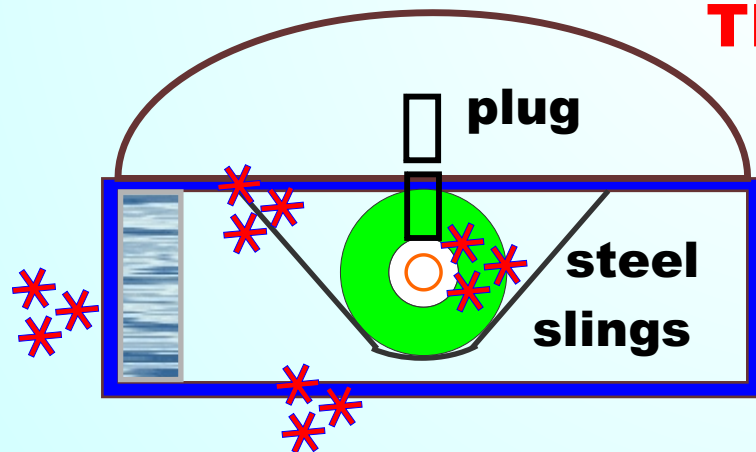
Infrastructure of the Future

We need benchmarks for "little" things and for large structures.



We have to establish reasonable procedures to implement and evaluate **"generator level cuts"**.

It will be necessary to use some intelligence to simulate large infrastructure and it has to be done before digging starts.



The hall has to be large!

water shielding

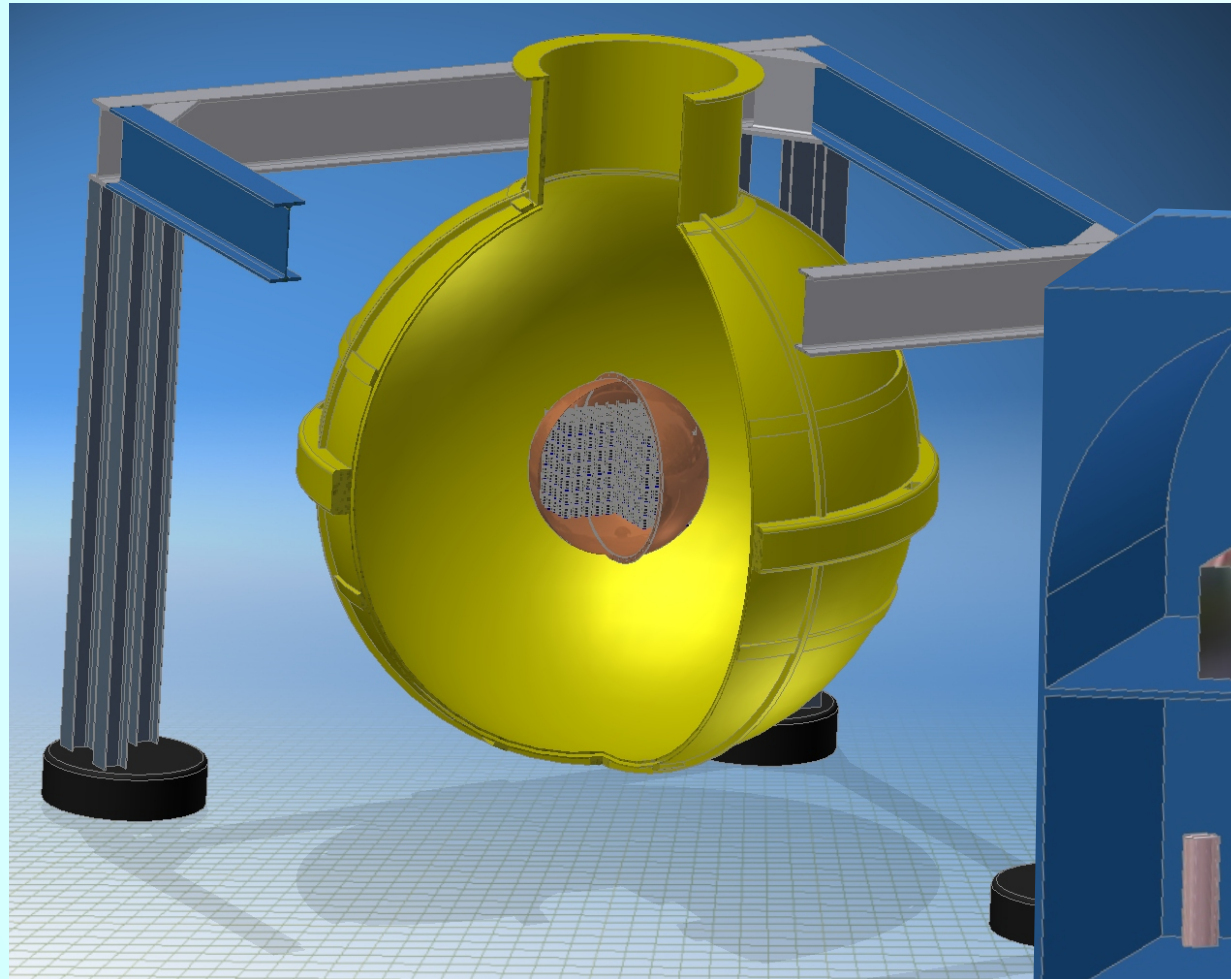
LAr shielding

Copper vessel with vacuum holds array

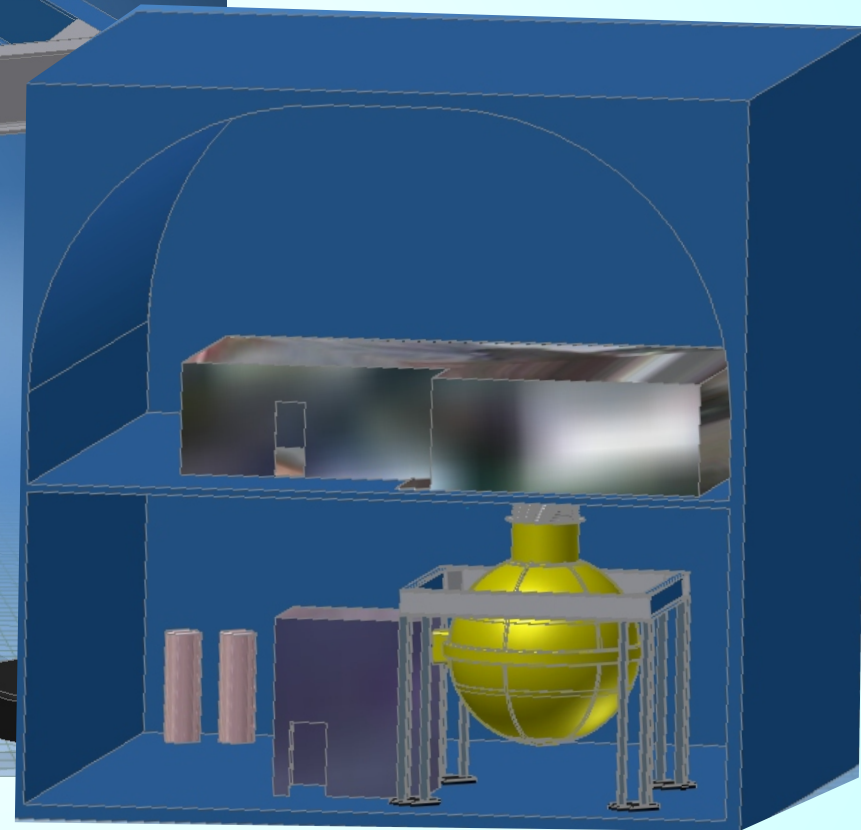


NO compromises!

Infrastructure of the Future



**Some
bad dreams.**



MC to be done soon.

[In]Famous Last Words

A 1ton experiment will be all about background.

I am absolutely not convinced that 1 ton Ge experiment makes sense.

New technology will be needed together with a gigantic amount of simulation.

We need benchmarks to verify our simulations and we need procedures to intelligently speed up the calculations.

MaGe should be made widely available and become a standard framework for such work.

