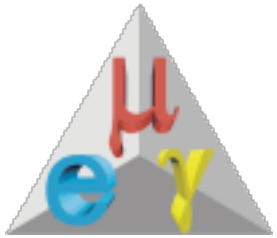

MEG実験用液体キセノン検出器のキセノンの液相純化について

名取寛顕

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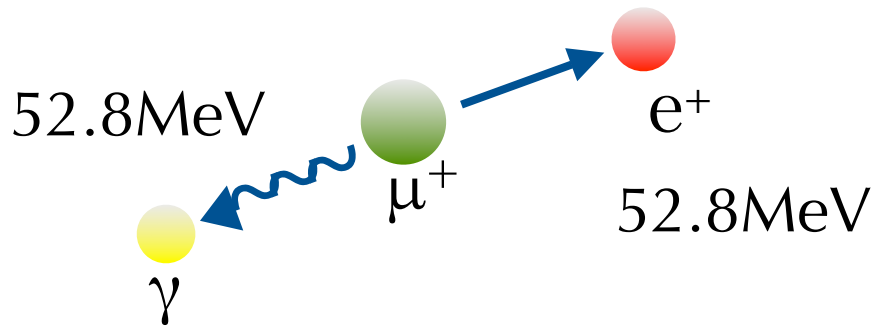
鈴木聡A，寺沢和洋A，道家忠義A，西口創，春山富義B，久松康子，
真木晶弘B，三原智，森俊則，山下了，山田秀衛

Contents

- MEG Experiment
- Liquid phase purification
- Summary

$\mu \rightarrow e+\gamma$ decay

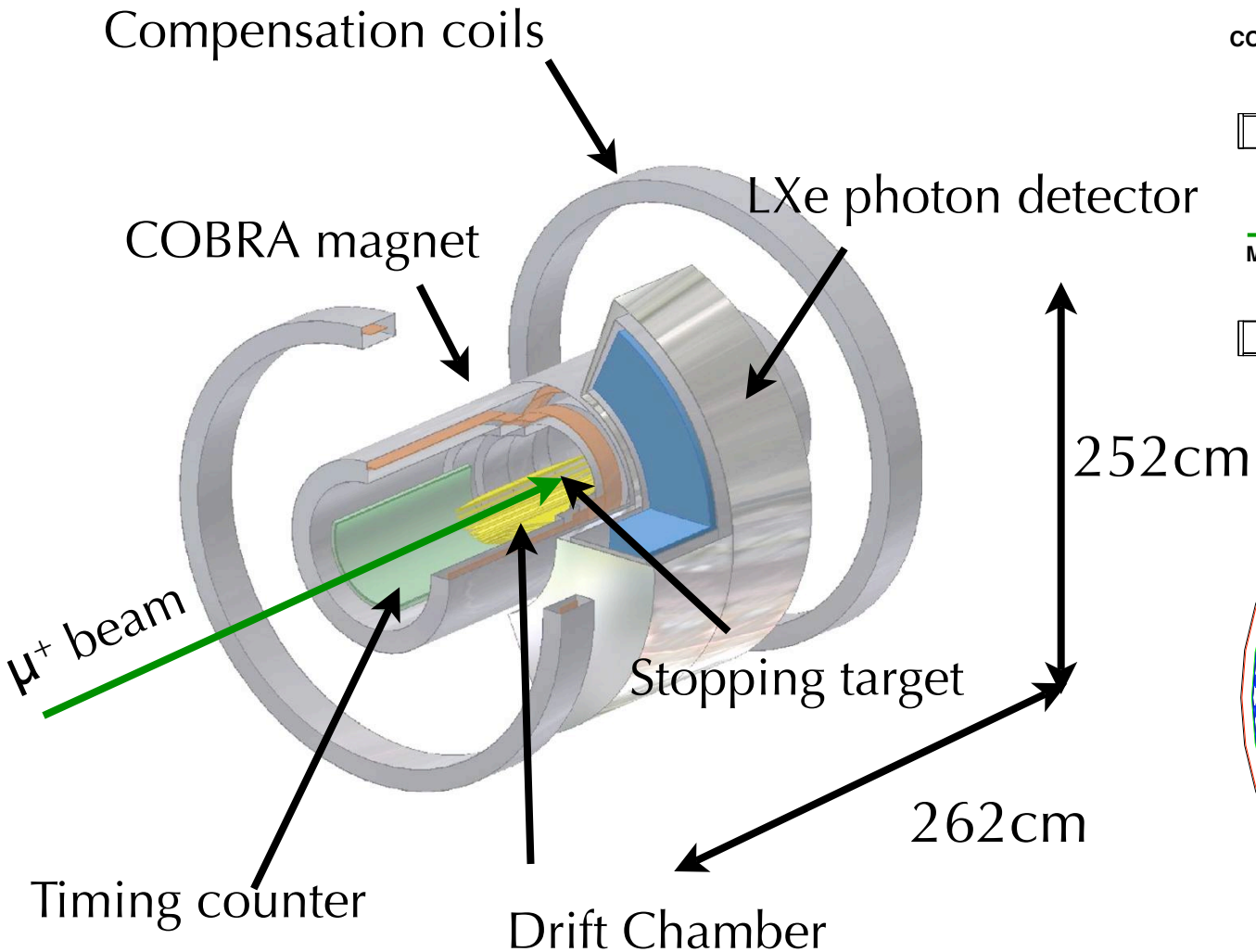


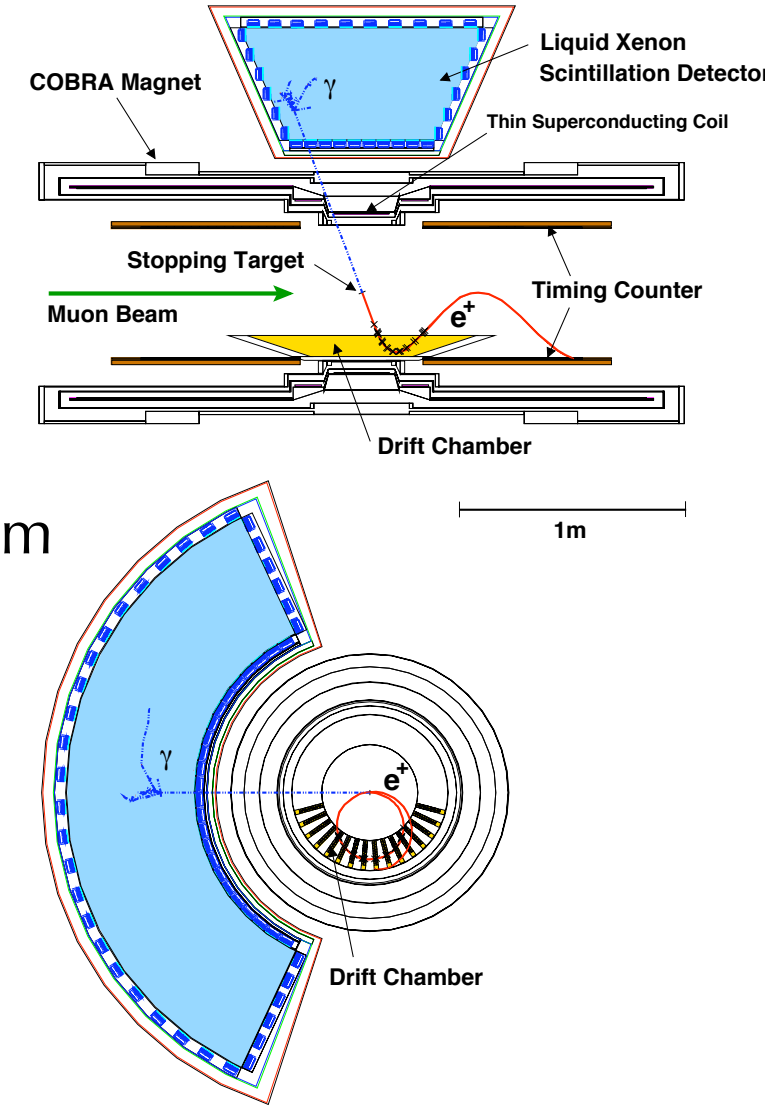
- LFV process
- Forbidden in the SM
- Sensitive to SUSY-GUT, seesaw

$Br < 1.2 \times 10^{-11}$(MEGA)

- Physics run: 2006 using most intense μ^+ beam @PSI(10^8 /s)
- Our goal : Br $10^{-13} \sim 10^{-14}$

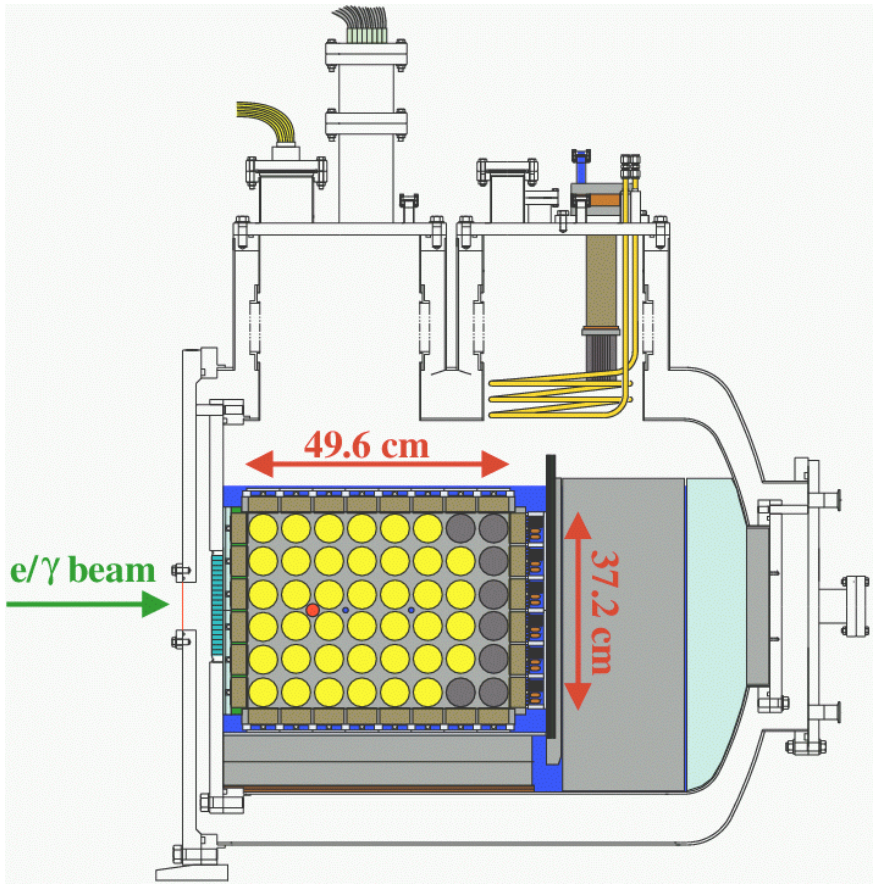
Detector





(14aSE-5 西口創 MEG実験用低物質量
ドリフトチェンバーの実機製作)

100 liter Prototype Detector



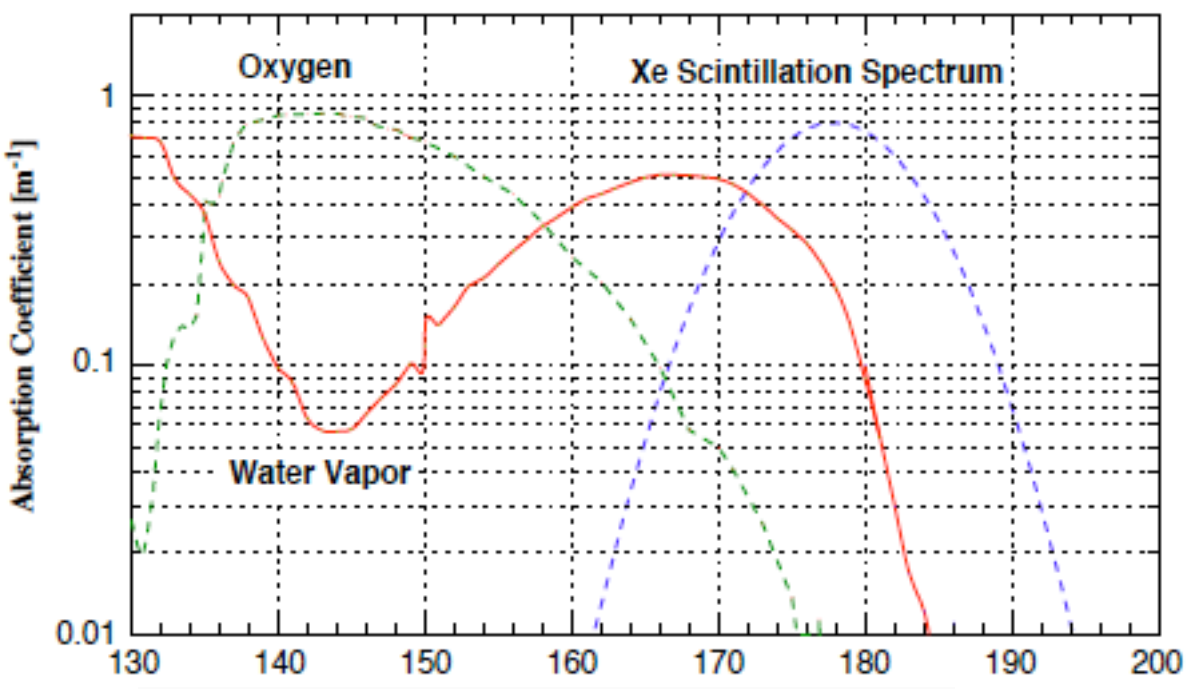
active volume : 68.6 liter

Absorption

$$Xe + Xe^* \rightarrow Xe^*_2 \rightarrow 2Xe + h\nu$$

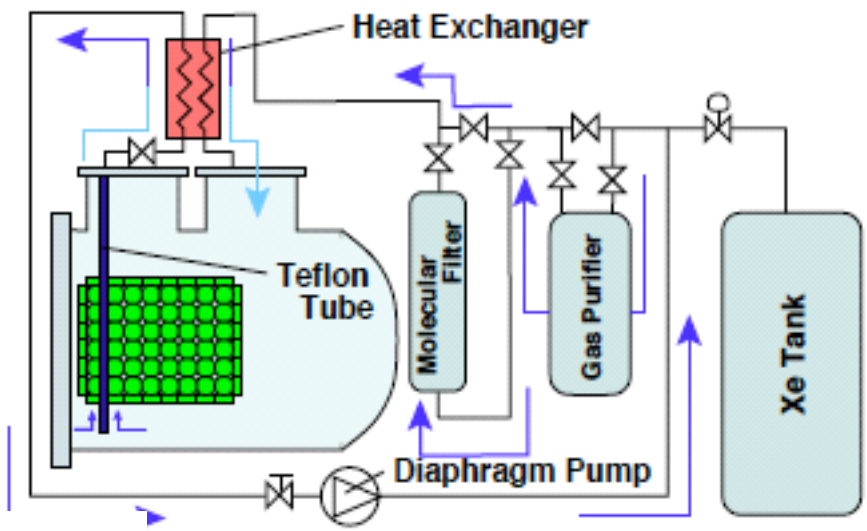
$$Xe^+ + Xe \rightarrow Xe^+_2$$
$$Xe^+_2 + e \rightarrow Xe^{**} + Xe$$
$$Xe^{**} \rightarrow Xe^*$$
$$Xe + Xe^* \rightarrow Xe^*_2 \rightarrow 2Xe + h\nu$$

Scintillation light from excimer state Xe_2^*
→No absorption by Xe

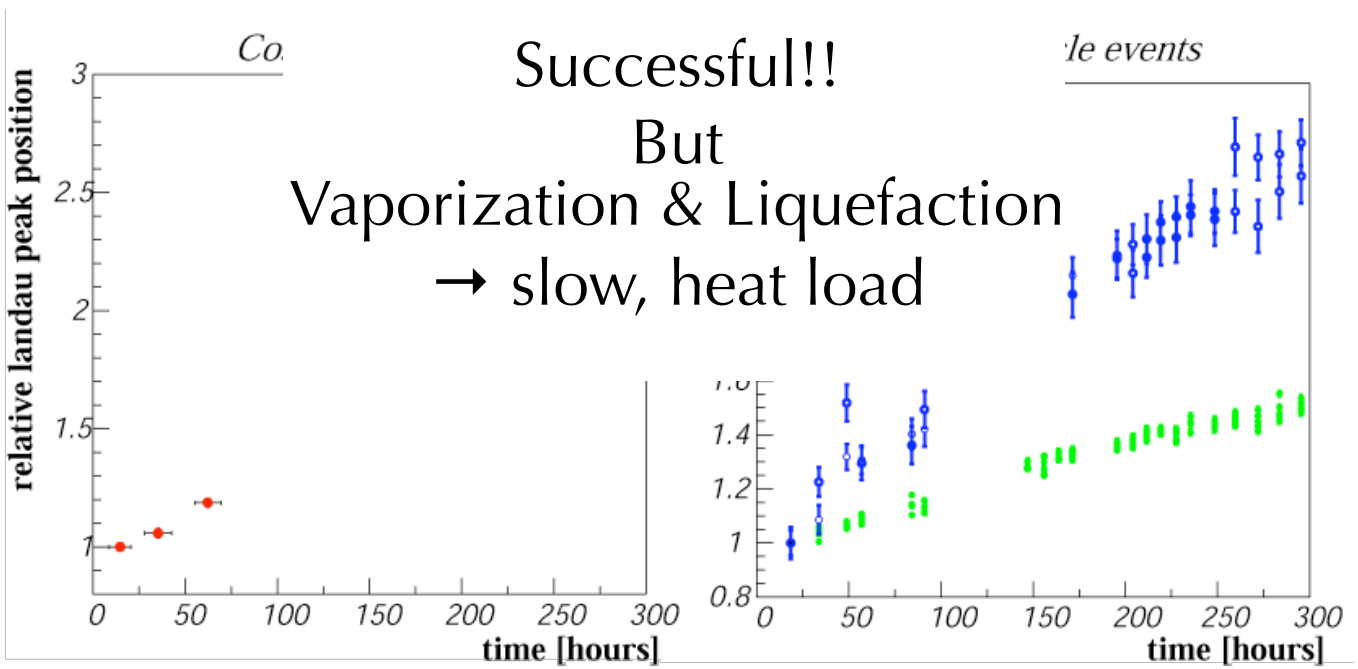


Absorption of scintillation light by impurities (H_2O, O_2, etc.)

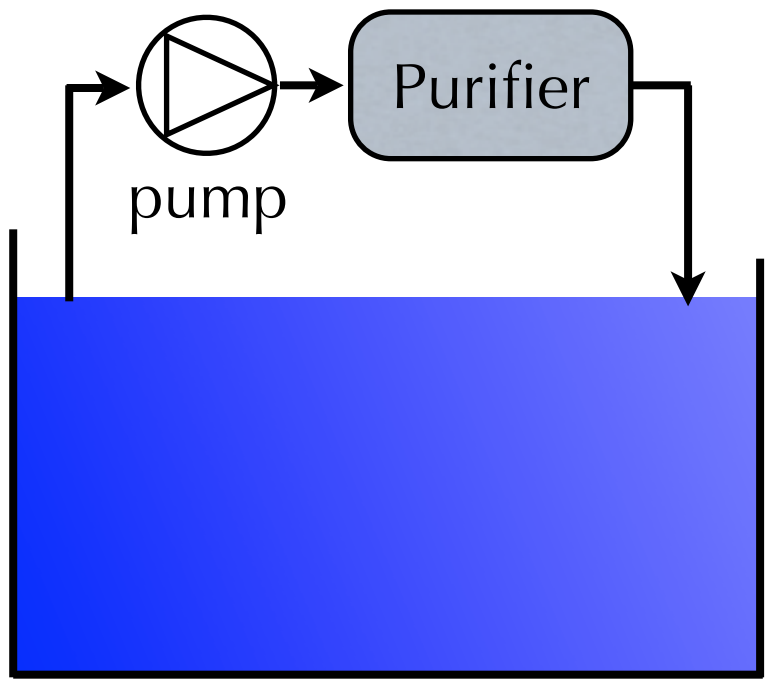
Gas phase circulating Purification (Done in 2002)



Successful!!
But
Vaporization & Liquefaction
→ slow, heat load



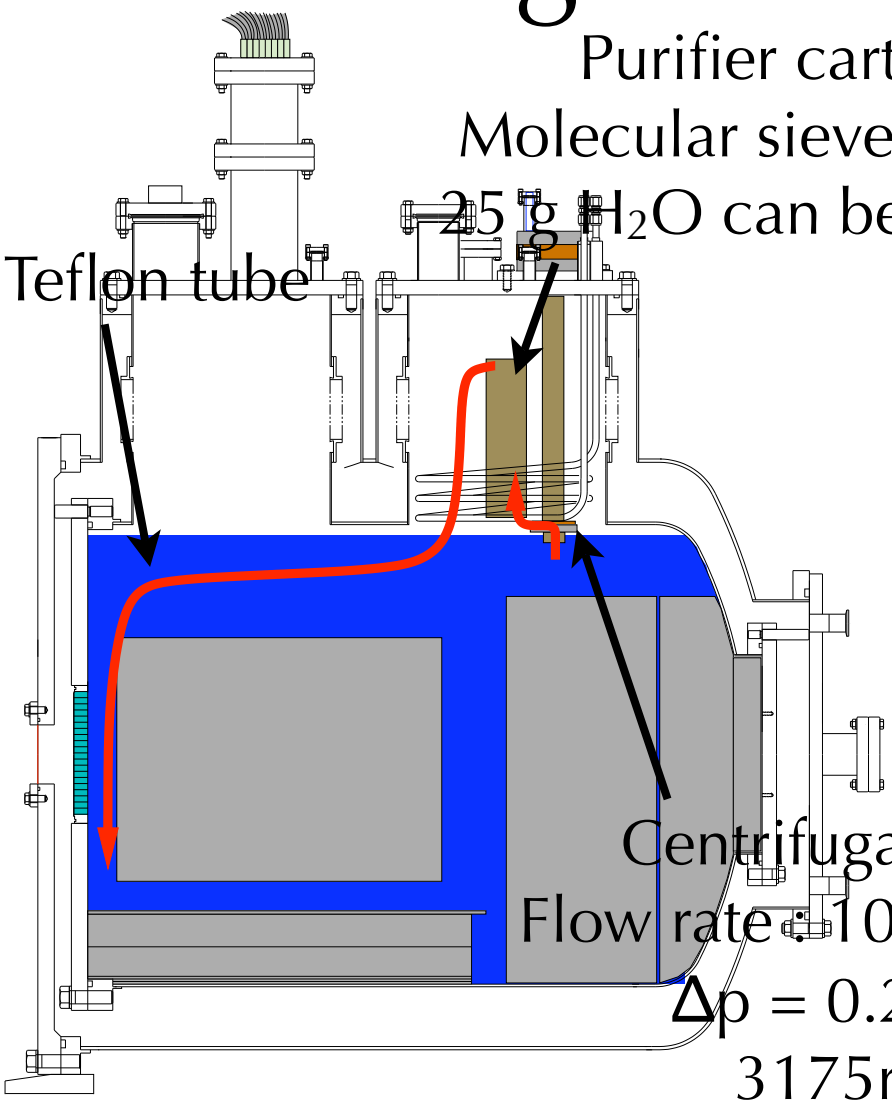
Liquid phase purification

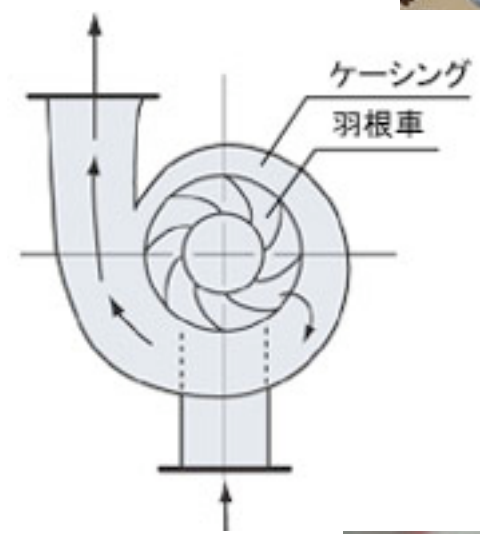


Liquid phase circulating Purification

Purifier cartridge
Molecular sieves(MS13A)
25 g H_2O can be absorbed

Teflon tube



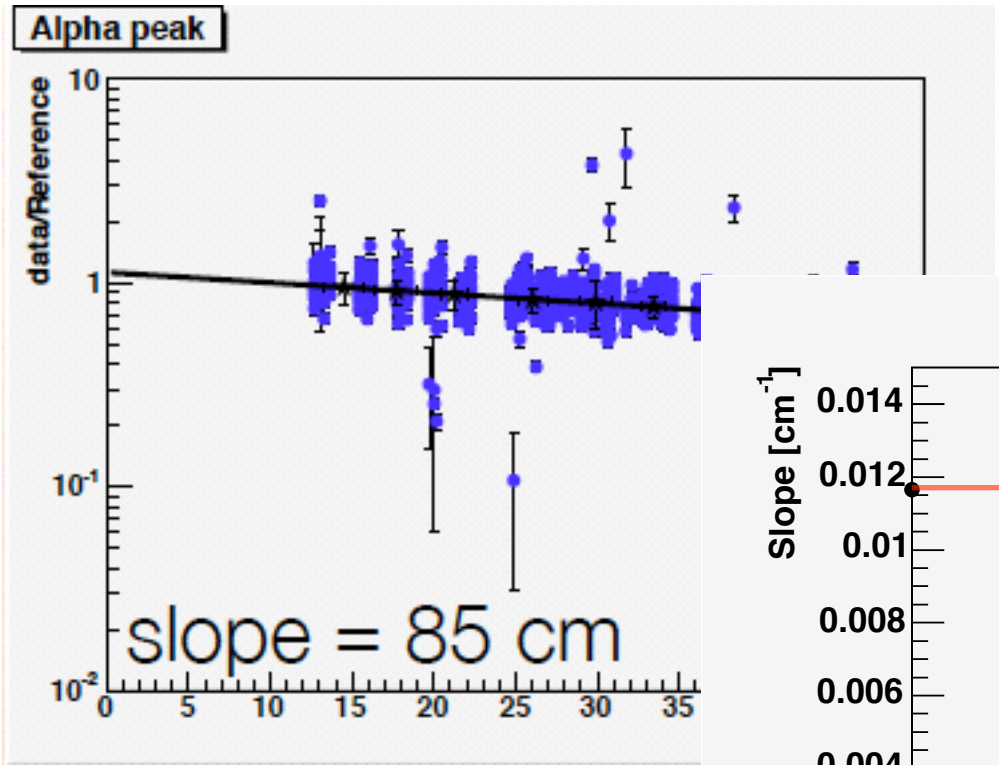


Centrifugal pump
Flow rate : 100 liter/hour
Δp = 0.2 MPa
3175rpm

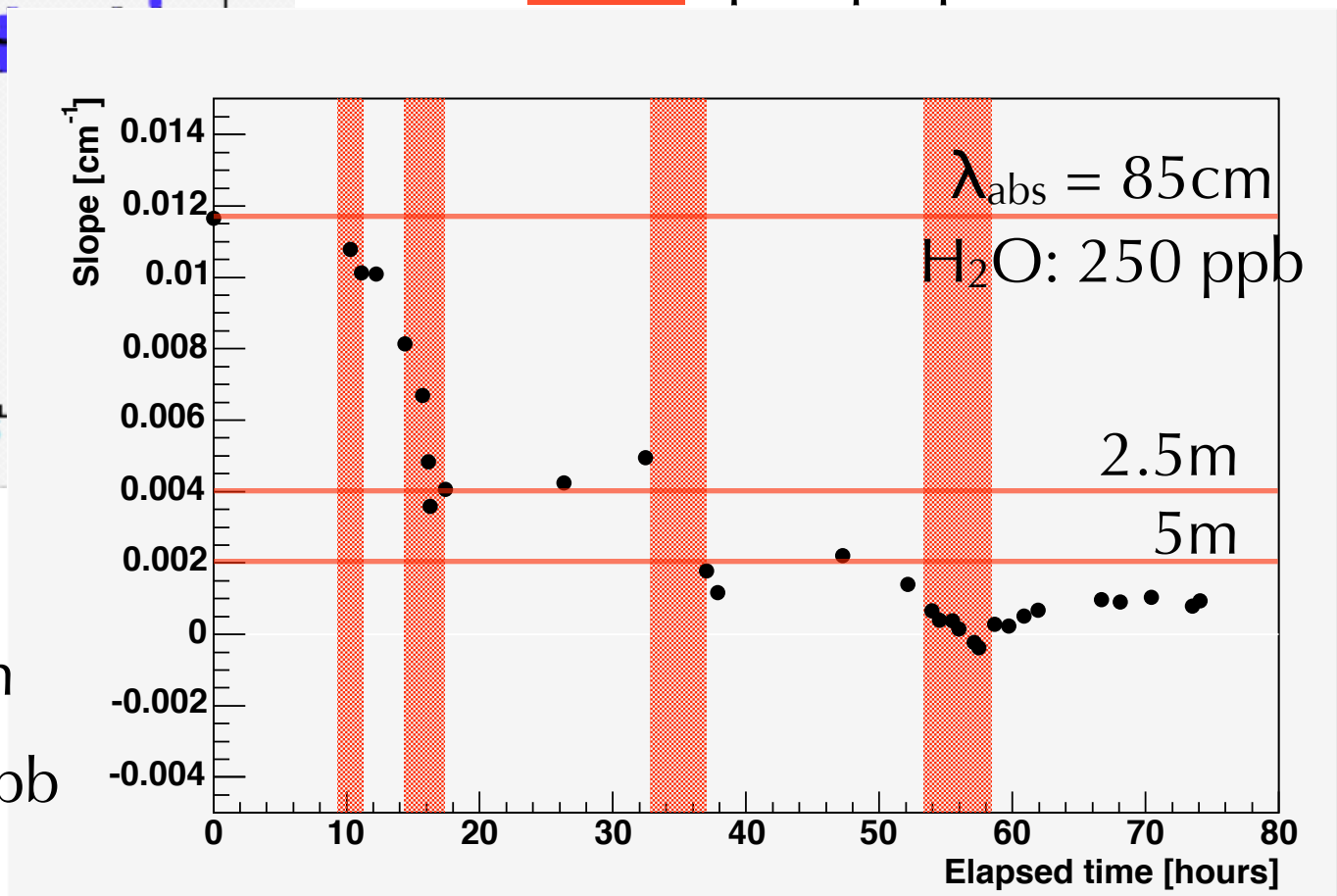
Before purification

We made water contained in LXe artificially

Absorption length



: pump operation

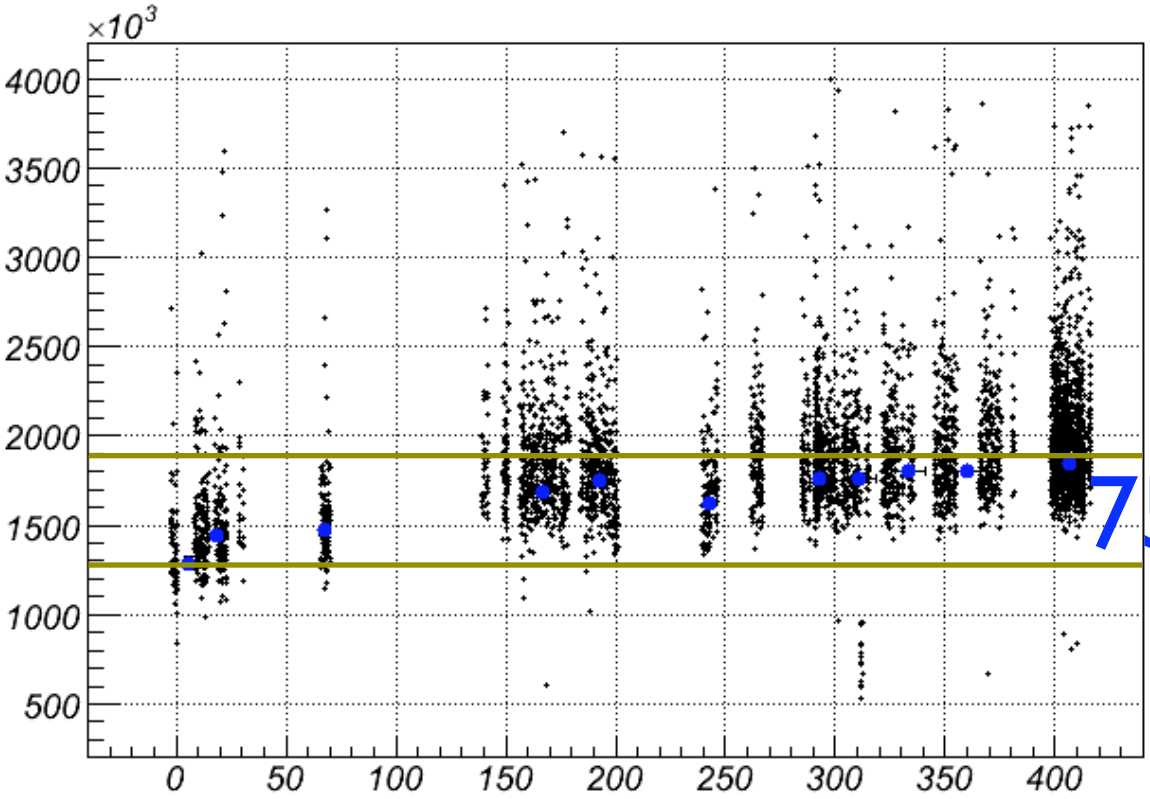


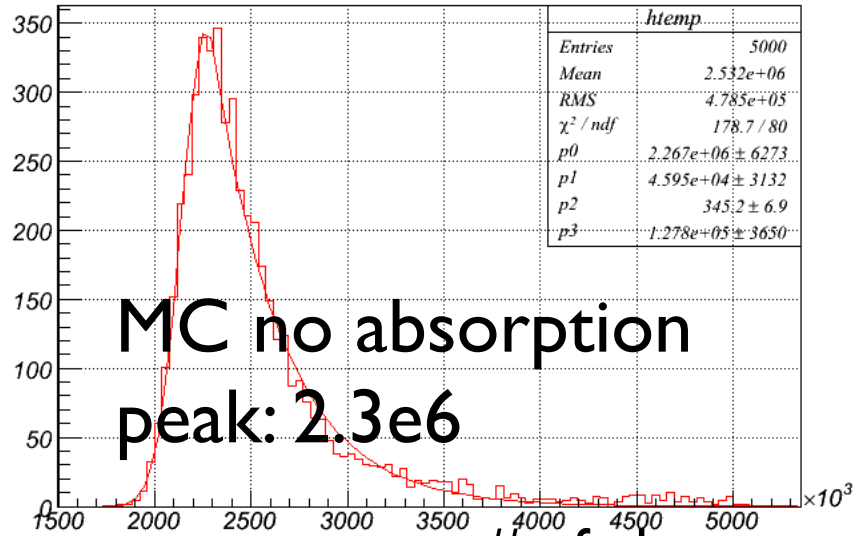
5 hours operation

λ_{abs} : 85cm → 2.5m

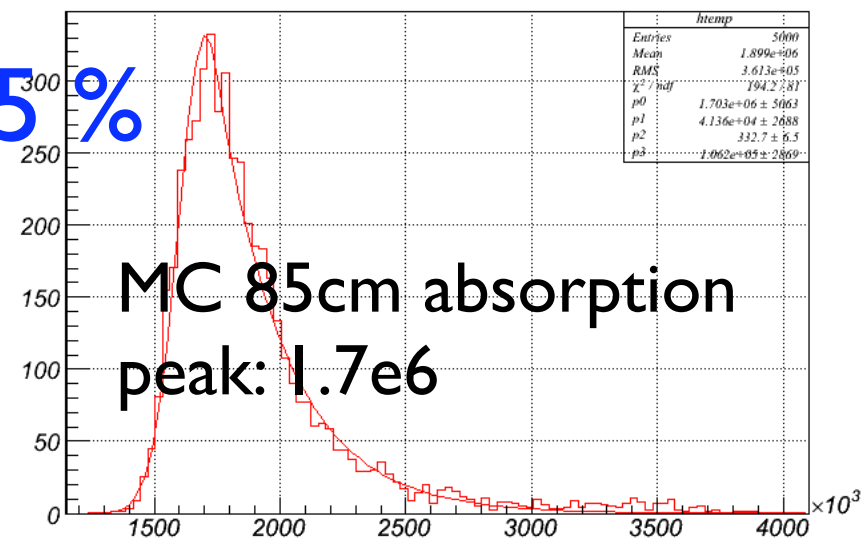
H_2O : 250 ppb → 40ppb

Cosmic ray data





75 %



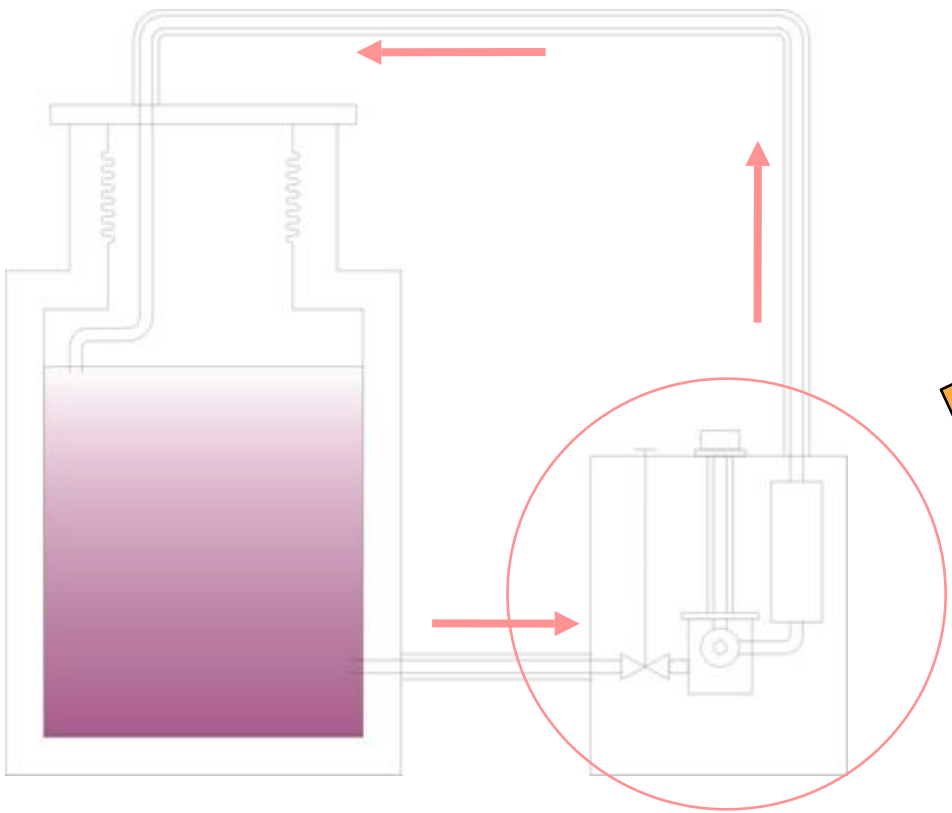
Heat load

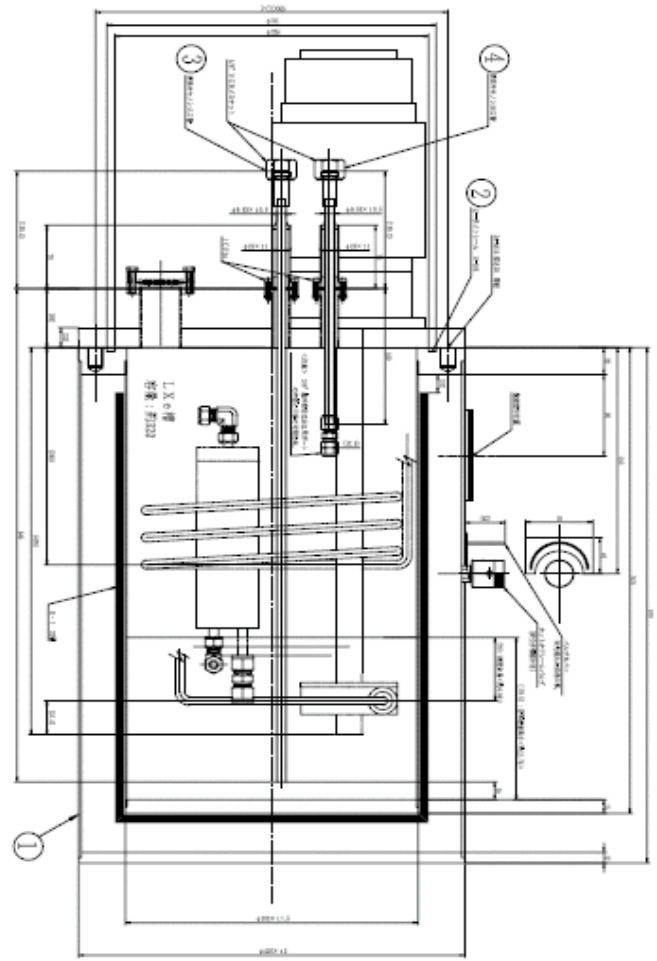
Additional heat load = 62 W

$\Delta pV = 0.2\ \mathrm{MPa} \times 100\ \mathrm{liter/hour} = 55\ \mathrm{W}$

→ pump is working properly

Liquid phase purifier in the final detector





Summary

- Need to get rid of impurities (H_2O)
- High speed purification succeeded
- Long absorption length achieved
- This system will be attached to the final detector and Physics run starts in 2006