# F / Dark Matter Search with Emulsion F D2



Leptons e- Neutrino | µ- Neutrino | τ - N



1971

主



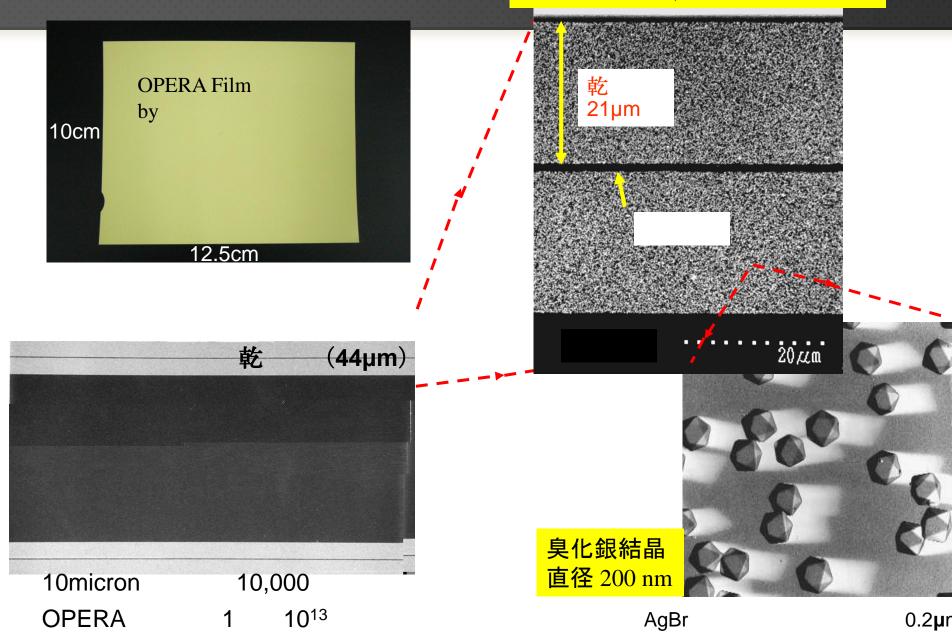
The Generations of Matter

1998

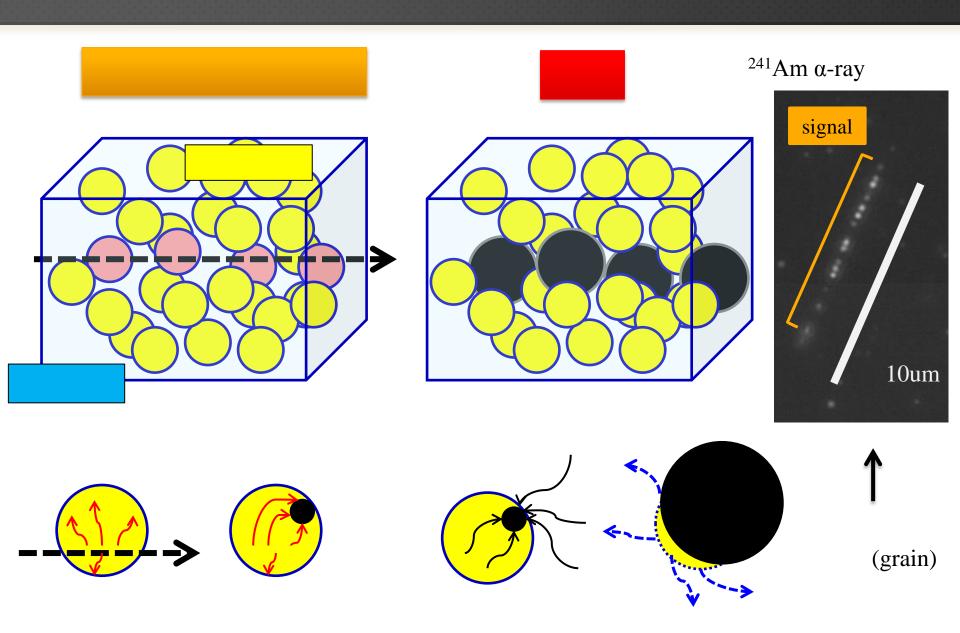
**DONUT** 

主

### ゼラチン~70%, 臭化銀結晶~30%



0.16/crystal



lacktriangle

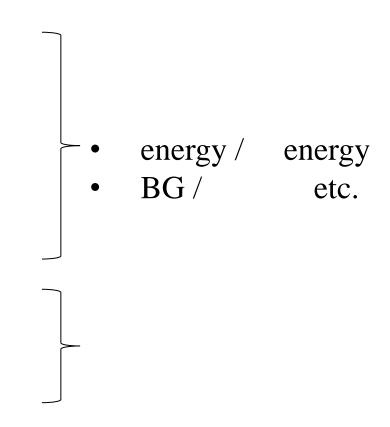
• BG rejection

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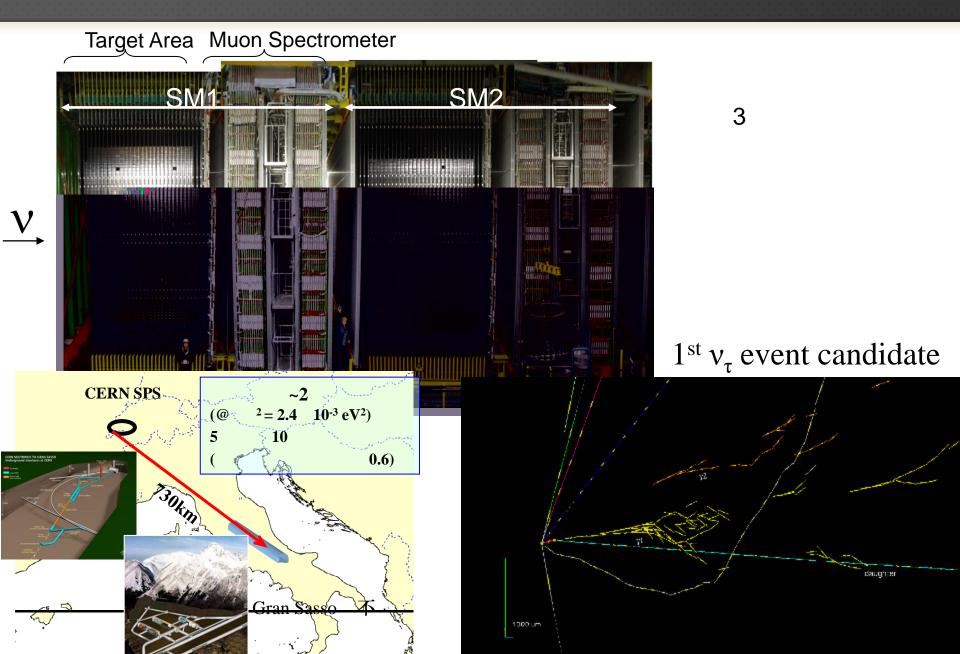
lacktriangle

•



F

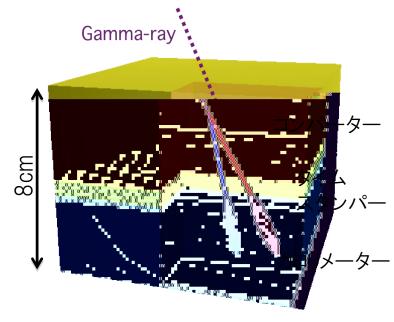
# **OPERA**



# GRAINE

2011 @

@SPSTJ2013



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•

• 2014

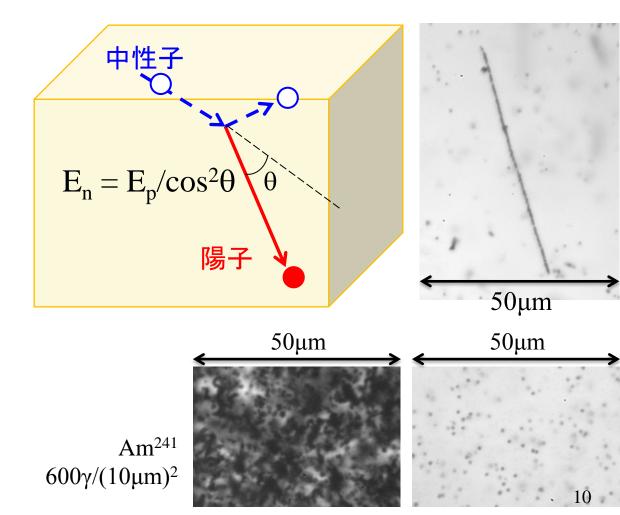
下

 $50m^2$ 

下

 $m^2$ 

**Emulsion** (keV~GeV)  $\mathbf{BG}$ 

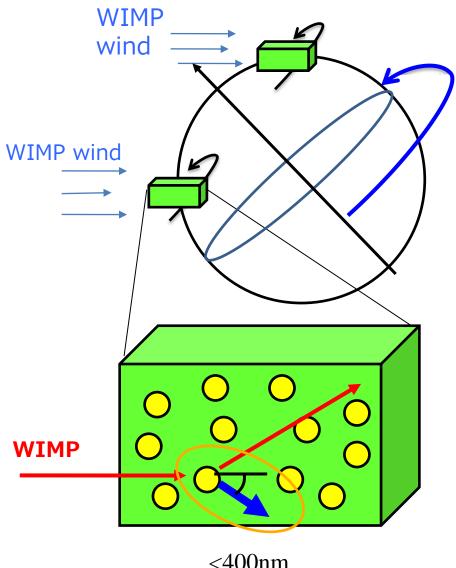


# **Directional Dark Matter**

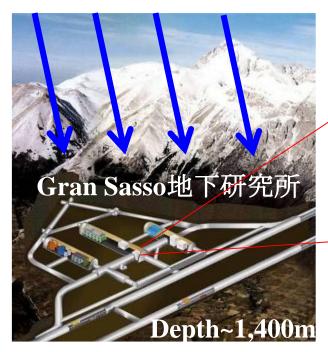
# Directional Dark Matter

### **Emulsion**

- Target CNO, AgBr
- Target Mass large
- Angular Resolution < 35
- BG rejection
  - proton, α-ray(tracking)
  - $-\gamma/e^{-}$  ( dE/dx
  - Random Fog (



# **Emulsion DM**



DAMA, XENON, DARK SIDE, CRESST

1~10g test run underground neutron (BG) search 10~100kg DAMA region



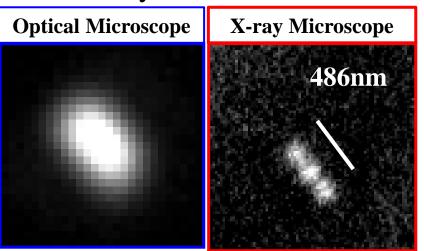
selection X-ray @SPring-8  $\Delta X \sim 70$ nm Plasmon analysis  $\Delta X < 50$ nm ?

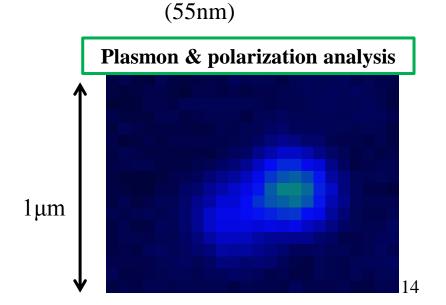
# $\overline{\mathrm{DM}}$

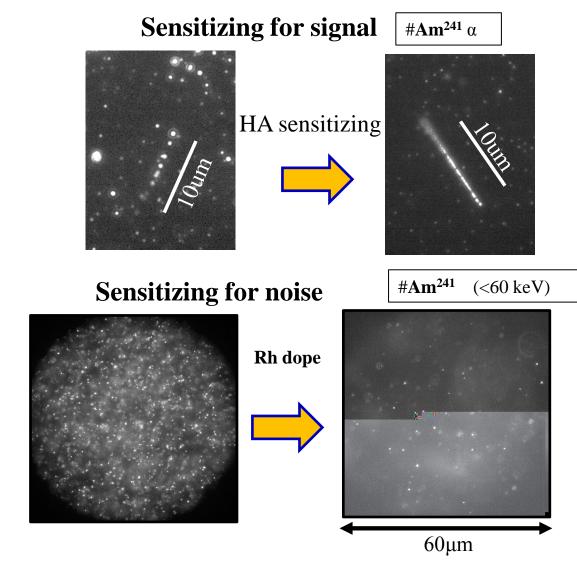
(200nm) 35nm crystal

500nm

- selection
- X-ray
- Plasmon analysis

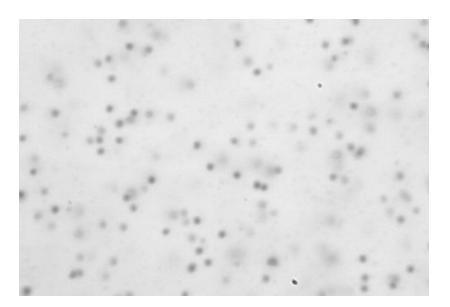






- $\alpha$ -ray  $\rightarrow$  tracking
- keV~ neutron recoil
- $\beta$ ,  $\gamma$   $\rightarrow$  Fog signal
- Fog (random noise)
  - BG
    - •
    - ( β )

rejection



Fog

# Fog like BG - rough estimation

### RI

```
^{40}K β-ray 9 10^{7}/kg/day Ge )
          99% AgBr KBr→NaBr
          1%
                                                   ^{40}K
• ^{14}\text{C }\beta\text{-ray} 5 10^6/\text{kg/day}
                  ()\rightarrow PVA(
              rejection (Rh dope) rejection power
                                                                 10^{4}
  RI
              Fog 10^{10} \sim 11/\text{kg} \rightarrow \text{rejection } 10^2 (
   Fog chance coincidence (200nm threshold)
    - track like 2 Fog 10^{3} ^{-5}/kg
    - track like 3 Fog 10^{-1} ^{-1}/kg
   track
                                                     upgrade
```