

# Status of SAND simulated geometry

INGRATTA GIANFRANCO

DUNE Italia collaboration meeting  
7-8/11/2022 - Frascati

# SAND COMPONENTS

## 1. SOLENOIDAL CRYOGENIC MAGNET

- 0.6 T
- 475 t

## 2. ELECTROMAGNETIC SAMPLING CALORIMETER

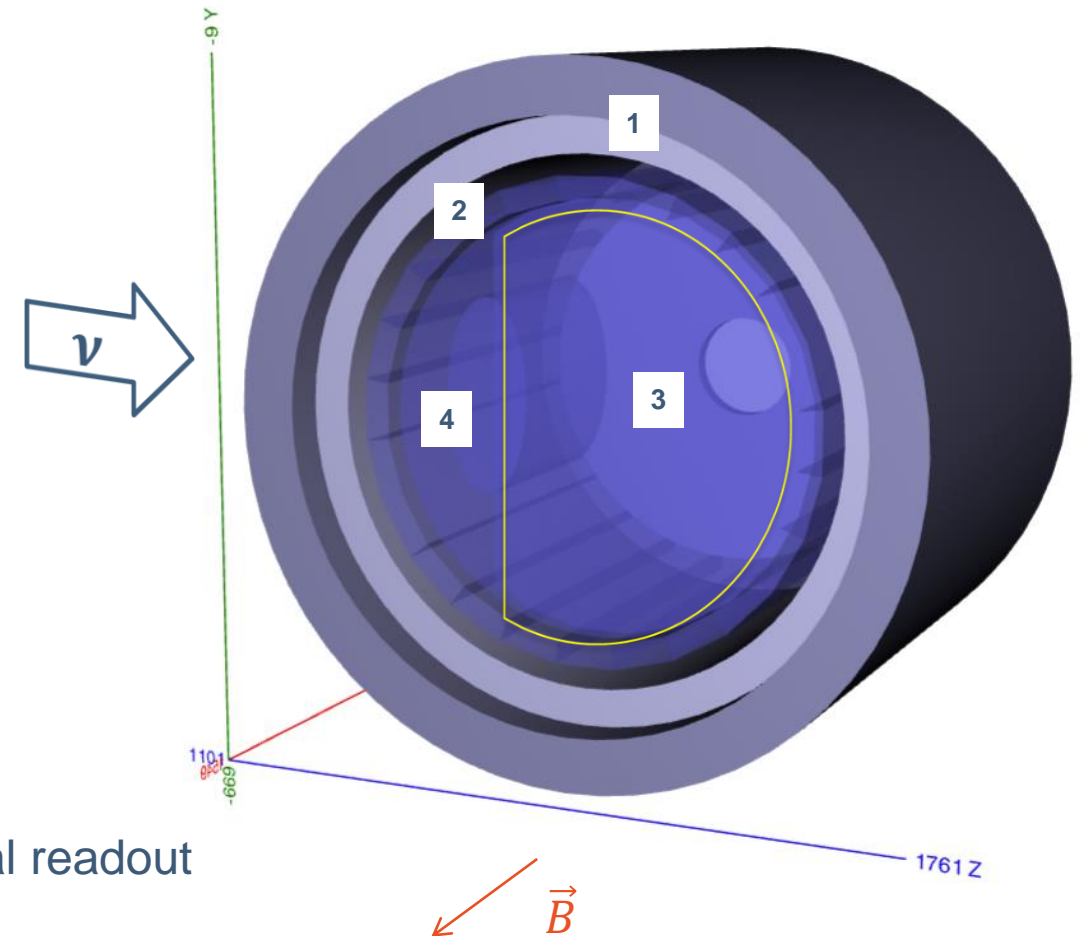
- $4\pi$  hermeticity
- Scintillating fibers and lead
- 90 t

## 3. STRAW TUBE TARGET TRACKER (STT)

- Low density
- Modular
- 7.8 t

## 4. GRAIN

- LAr target
- Tracking system based on scintillation light optical readout
- 1.3 t

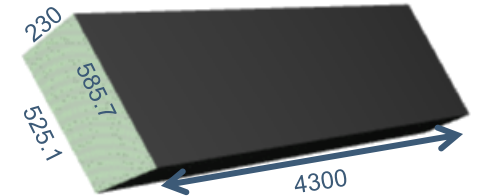
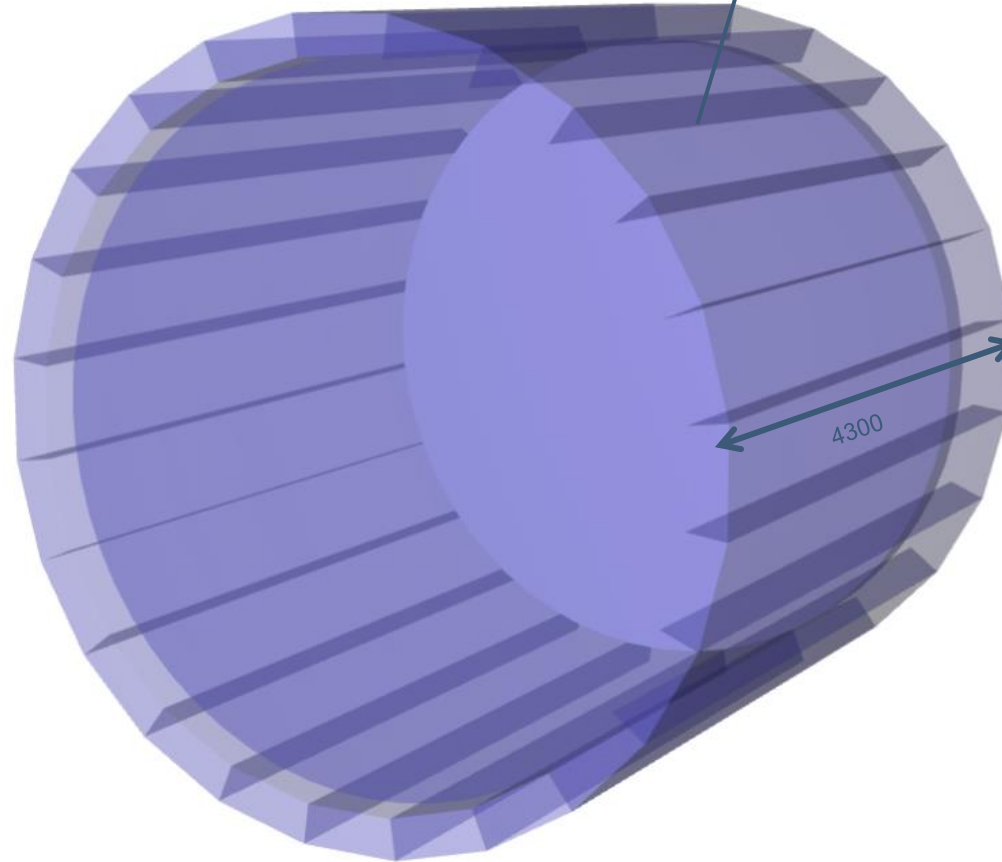
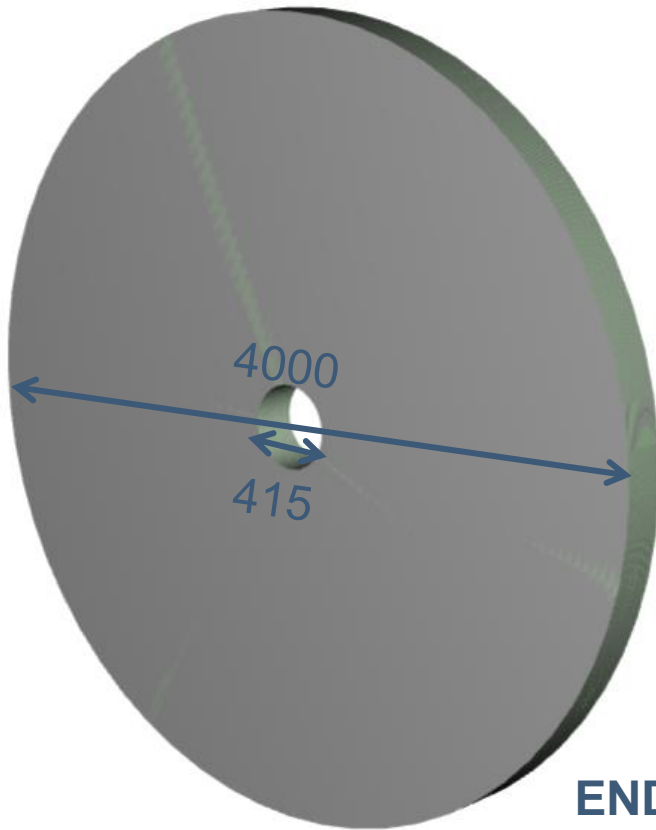


# ELECTROMAGNETIC CALORIMETER

\*all lengths in mm

24 barrels with trapezoidal shape

2 endcap modules



**ENDCAP MODULE:**  
Composition as the ECAL BARREL

## ECAL BARREL:

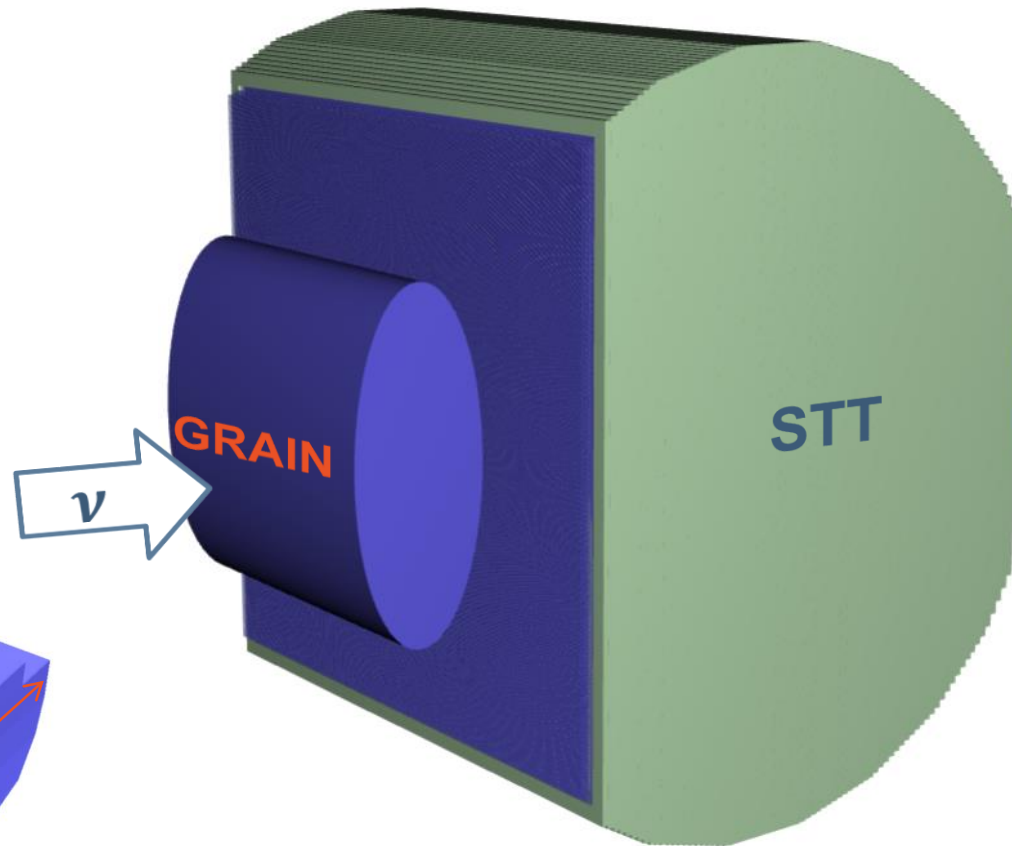
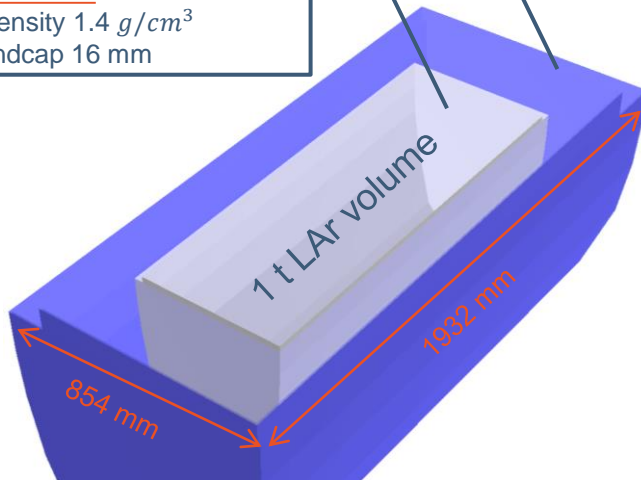
- 209 layers 40  $\mu\text{m}$  lead ( $11 \text{ g/cm}^3$ )
- 209 layers 70  $\mu\text{m}$  scintillators (mixture C, H,  $1.05 \text{ g/cm}^3$ )

# SAND INNER VOLUME

\*all lengths in mm

- Ext vessel**
- Carbon Fiber 6 mm + Honeycomb 50 mm + Carbon Fiber 6 mm
  - Density  $1.6 \text{ g/cm}^3$
  - endcap 16 mm **Steel**

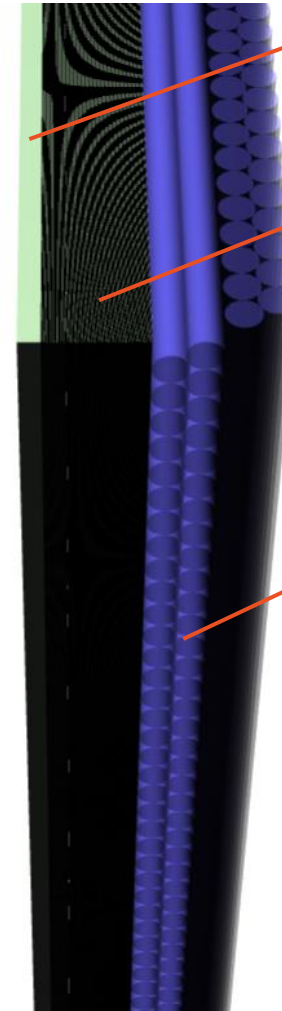
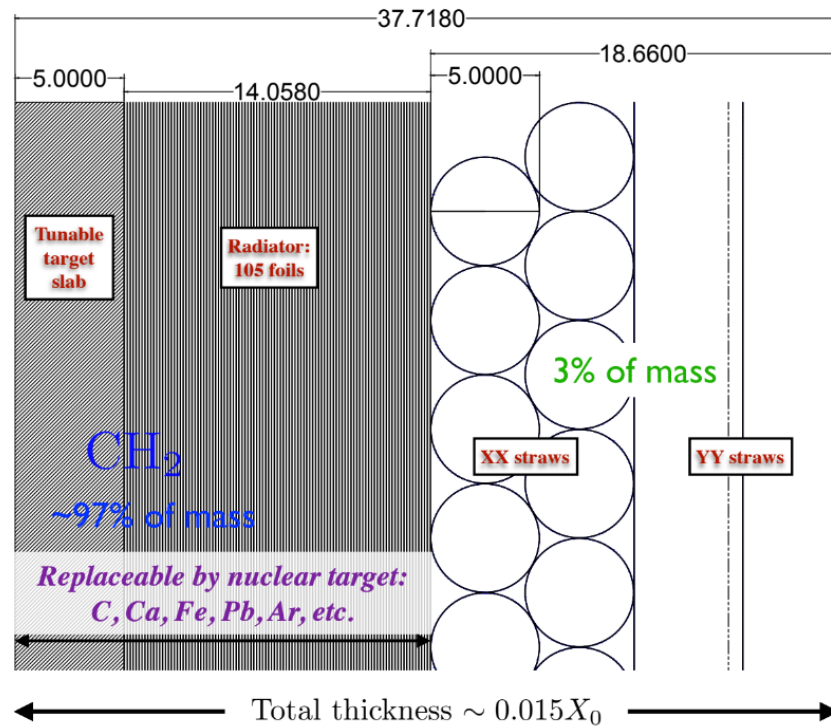
- Inner vessel**
- Aluminum 12 mm
  - Density  $1.4 \text{ g/cm}^3$
  - endcap 16 mm



- Mass of 7.8 t
- 82 modules: 1 **C** module every 9  $CH_2$  modules + 5 tracking modules

# CH<sub>2</sub> STT module (standard)

\*all lengths in mm

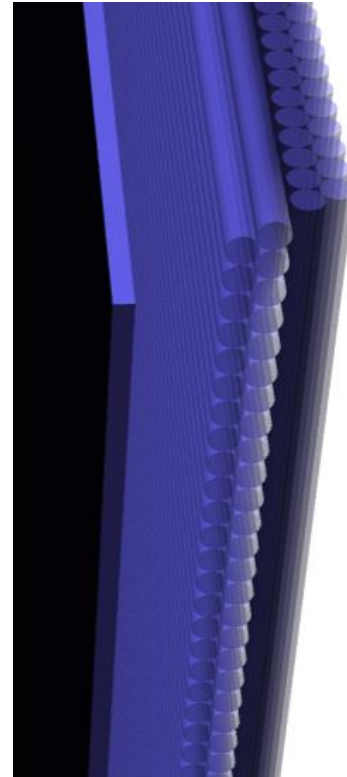
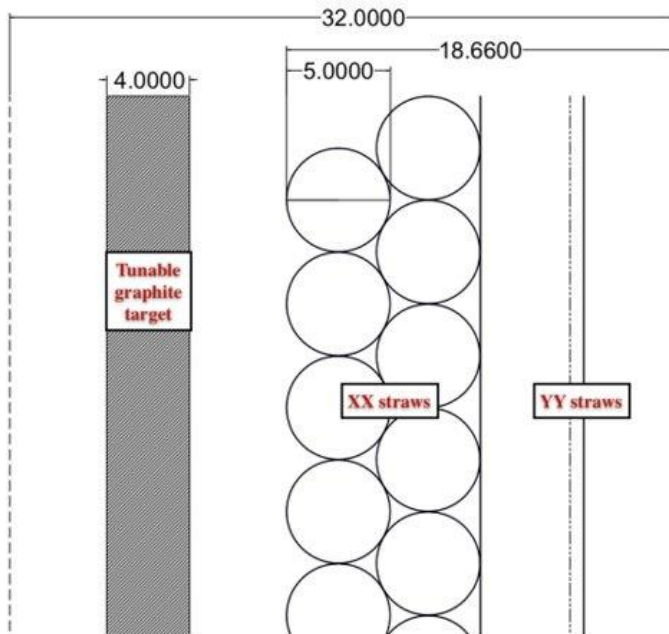


- **Target:** CH<sub>2</sub> (C for graphite modules)
- **Radiator:** 105 foils 18  $\mu\text{m}$  thickness interleaved with air gaps
- 4 planes of XXYY straw tubes
- **Straw composition:**
  - Gas: Xe/CO<sub>2</sub> (70/30) mixture at 1.9 atm, density  $9 \times 10^{-3} \text{ g/cm}^3$
  - Wire: 20  $\mu\text{m}$  tungsten + 20 nm gold coating
  - Tube: 12  $\mu\text{m}$  mylar + 70 nm aluminum coating

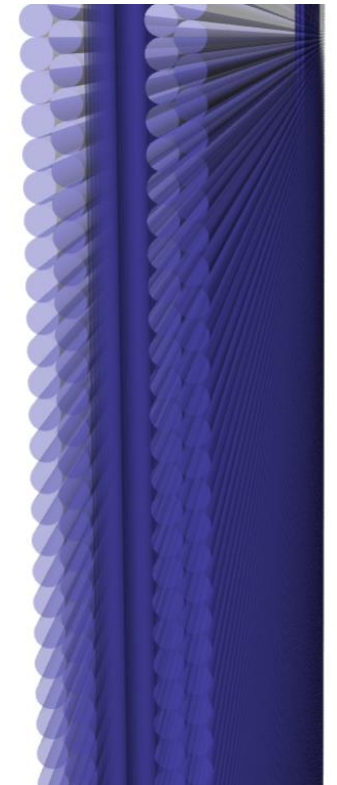
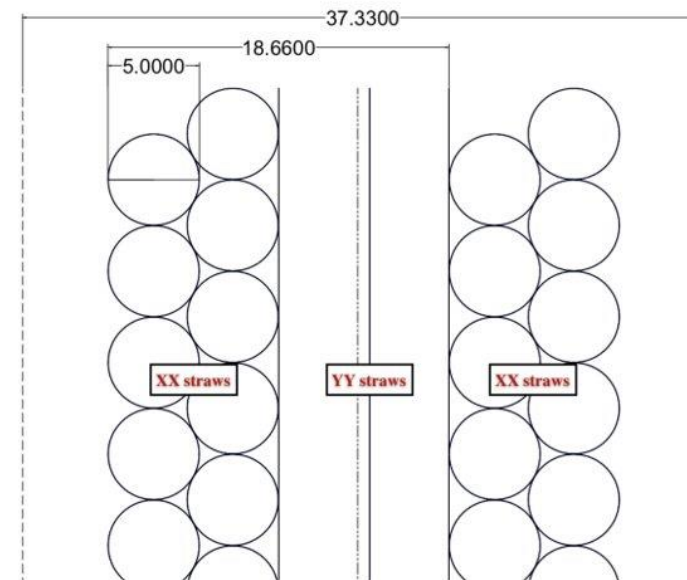
# C and tracking STT modules

\*all lengths in mm

## C module



## Tracking module



Straw gas:  $Ar/CO_2$  density  $3.4 \times 10^{-3} g/cm^3$

# OUTLOOK

- SAND geometry fully integrated in DUNE ND geometry
- Github repository : [DUNE/dunendggd: A tool for complicated detector geometry generation \(github.com\)](https://github.com/DUNE/dunendggd)
- Command to generate SAND geometry :  
./build\_hall.sh "sand\_opt2"
- Output file: SAND\_opt2.gdml

