

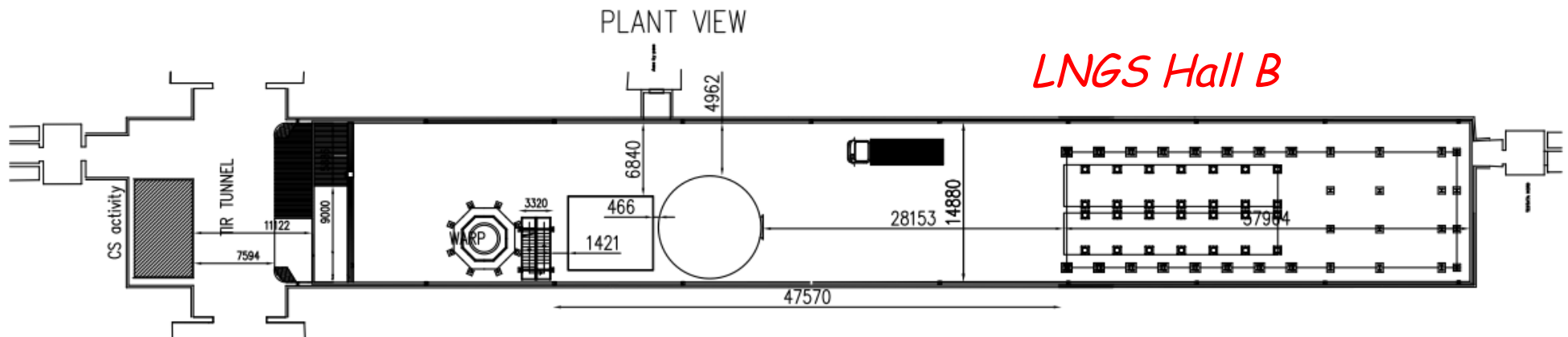
Infrastructure needs of the ICARUS T600 detector

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T600 Installation at LNGS

- The T600 in Gran Sasso occupies an area of about $12 \times 30 \text{ m}^2$.
- The layout is organized on three levels:
 - Ground lev.: cryo-coolers, safety sensors;
 - 2nd lev.: R/O electronics, Argon purification, vacuum system, nitrogen distribution and circulation, gas argon and nitrogen exhaust pipes;
 - 3rd lev.: Trigger electronics, HV supply, LAr and LN2 storage.
- With the exception of the equipment on the 2nd level, the layout can be re-configured in a different geometry.



Stirling skid system (Ground lev.)



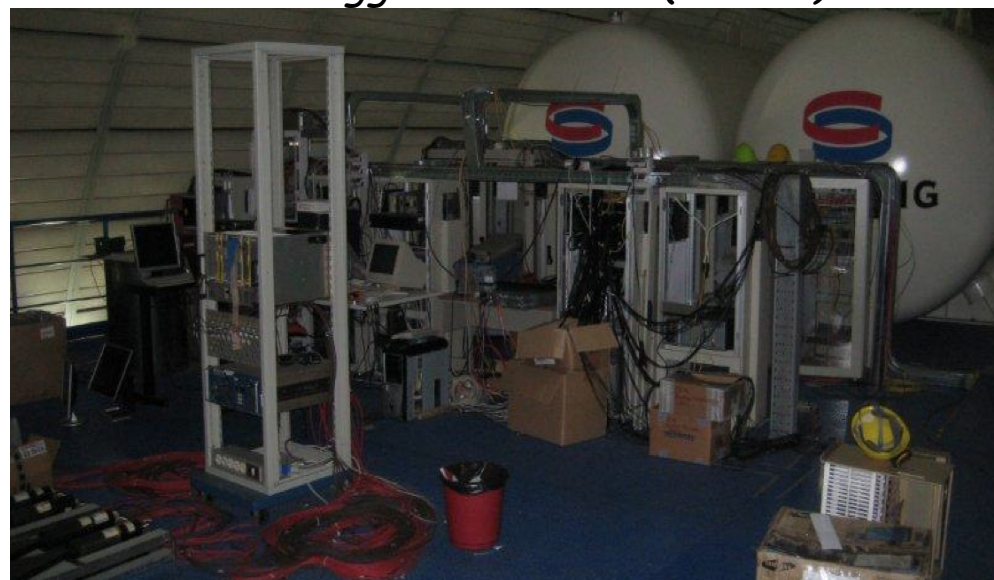
Electronics area (2nd lev.)



LN2 tanks area (3rd Lev.)



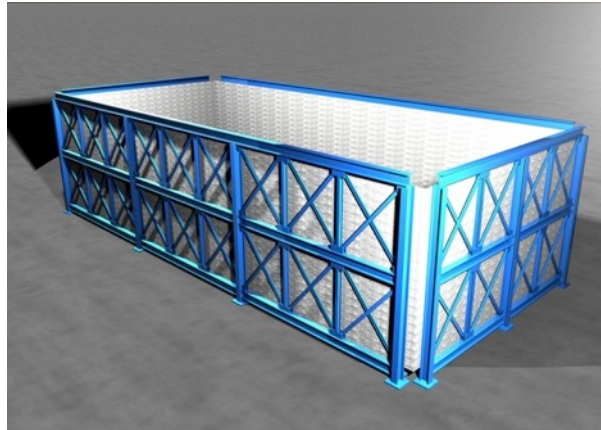
Trigger el. and HV (3rd lev.)



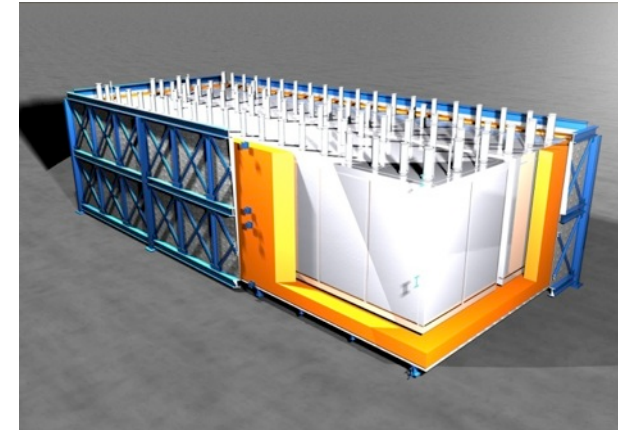
T600 Thermal insulation

- The new thermal insulation will arrive at FNAL split in large pre-assembled pieces.
- It will be provided with an external stiffening cage (warm vessel). Installation will proceed from the inside of the insulation volume.
- At least 50 cm of space has to be left all around the warm vessel to allow for (room temperature) air circulation, to avoid ice formation.

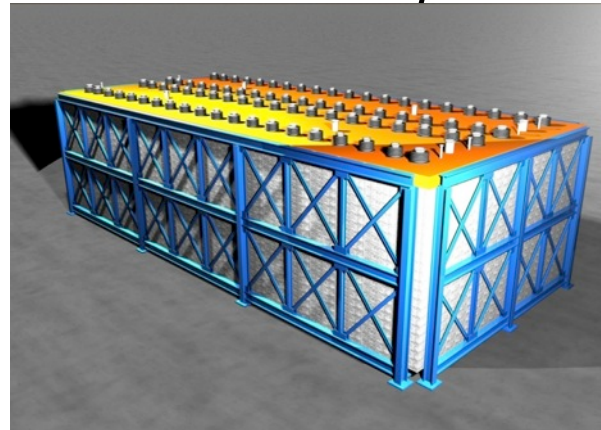
Warm cage + ext. skin



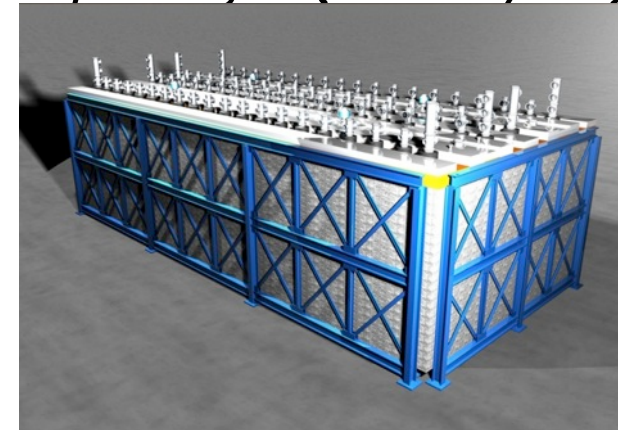
Insulation + T600 modules



Insulation top



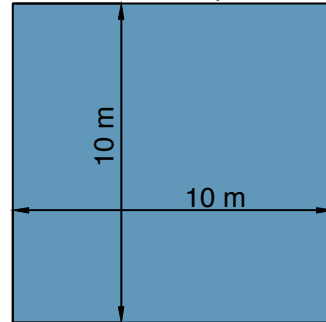
Top flanges (final layout)



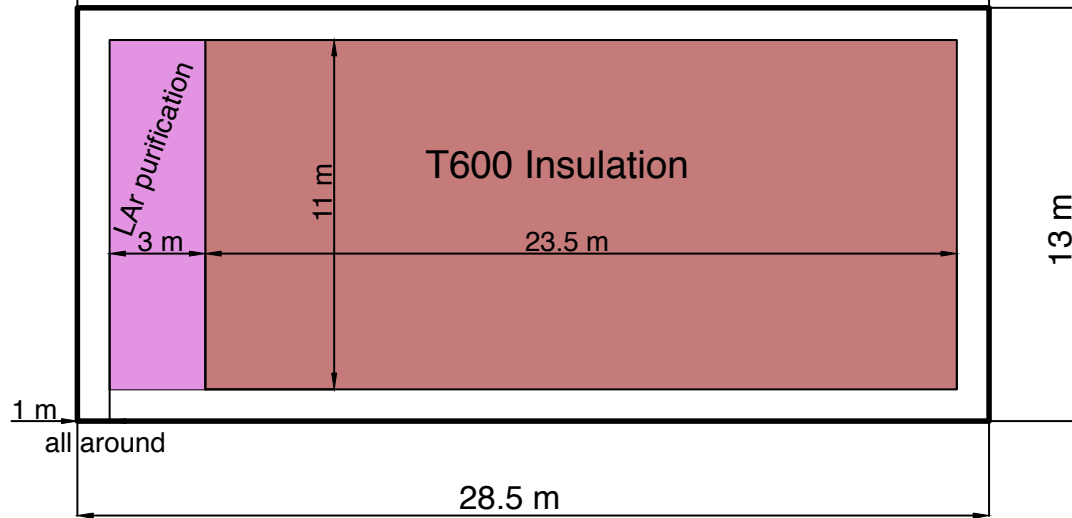
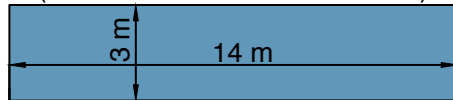
T600 Plant Space Requirements

TOP VIEW

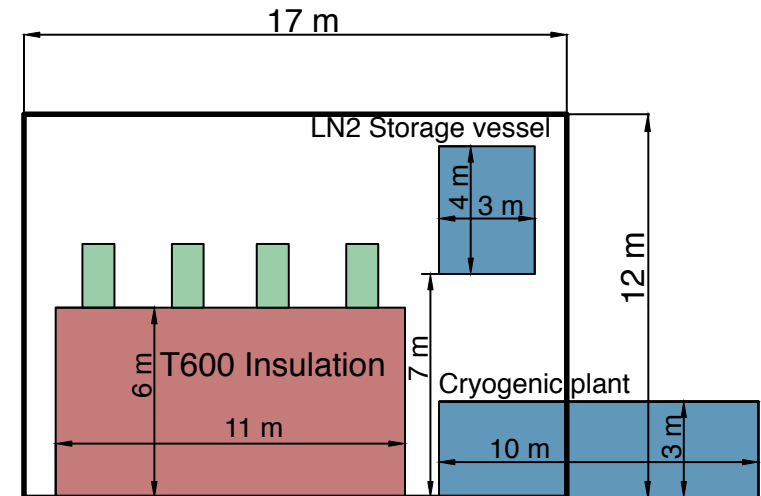
Cryogenic plant area (mainly cryo-coolers)
It can be re-distributed to adapt to the available space



LN2 Storage vessel
(7 m above the T600 basement)



FRONT VIEW



Technical Infrastructure at FNAL

● Civil engineering:

- 1 crane 5/10 t capacity
- External roof hosting the LN2 and LAr discharge ramp

● Mains:

- 400 kW: Stirling re-liquefaction system;
- 100 kW: R/O electronics;
- 150 kW: Cryogenics & others.
- **Total: 700 kW** - Trafos: 2x1 MVA
- General services (light, heating, cooling, ventilation, etc.) not included.
- UPS for the control and monitoring system.

● Cooling:

- Closed circuit cooling water:
 - flow rate = $30\text{m}^3/\text{h}$;
 - pressure drop = 1.5bar ;
 - temperature drop = 10°C

● **Safety (specific requirements):**

- Separation wall around ICARUS and cryogenics areas: 3-4 m high
- Ventilation: following FNAL instructions with 2 flow rates systems, the minor always running, the other to intervene in case of alarm (low Oxygen). Aspiration at ground level outlet outside the hall.
- Safety sensors: oxygen, smoke, temperature.
- Emergency lights.
- Cameras.
- Audio alarms.

● **Control room:**

- Computer environment (DAQ, slow control system, etc.) 4x6 m², the the FAR Detector building.

● For other standard services (Conditioning, heating, etc.) we have no specific requests and therefore FNAL Standards and Rules apply.

Arrival at FNAL

- **Transport** of the T600 to FNAL can occur between **end 2015 and beginning 2016**.
- The time needed to re-install the T600 and to be ready for the commissioning will be about 6 months.
 - Most of the components will arrive at FNAL largely pre-assembled and tested. The onsite assembly operations, and the related manpower, will be limited and dominated by external cabling and electronics installation.
- **Commissioning** can take place during the **second half of 2016**. It will require from 3 to 5 months (it was 5 months in LNGS including about 3 months of vacuum pumping).
- **Readiness for data taking can be at the end of 2016.**



Thank you !