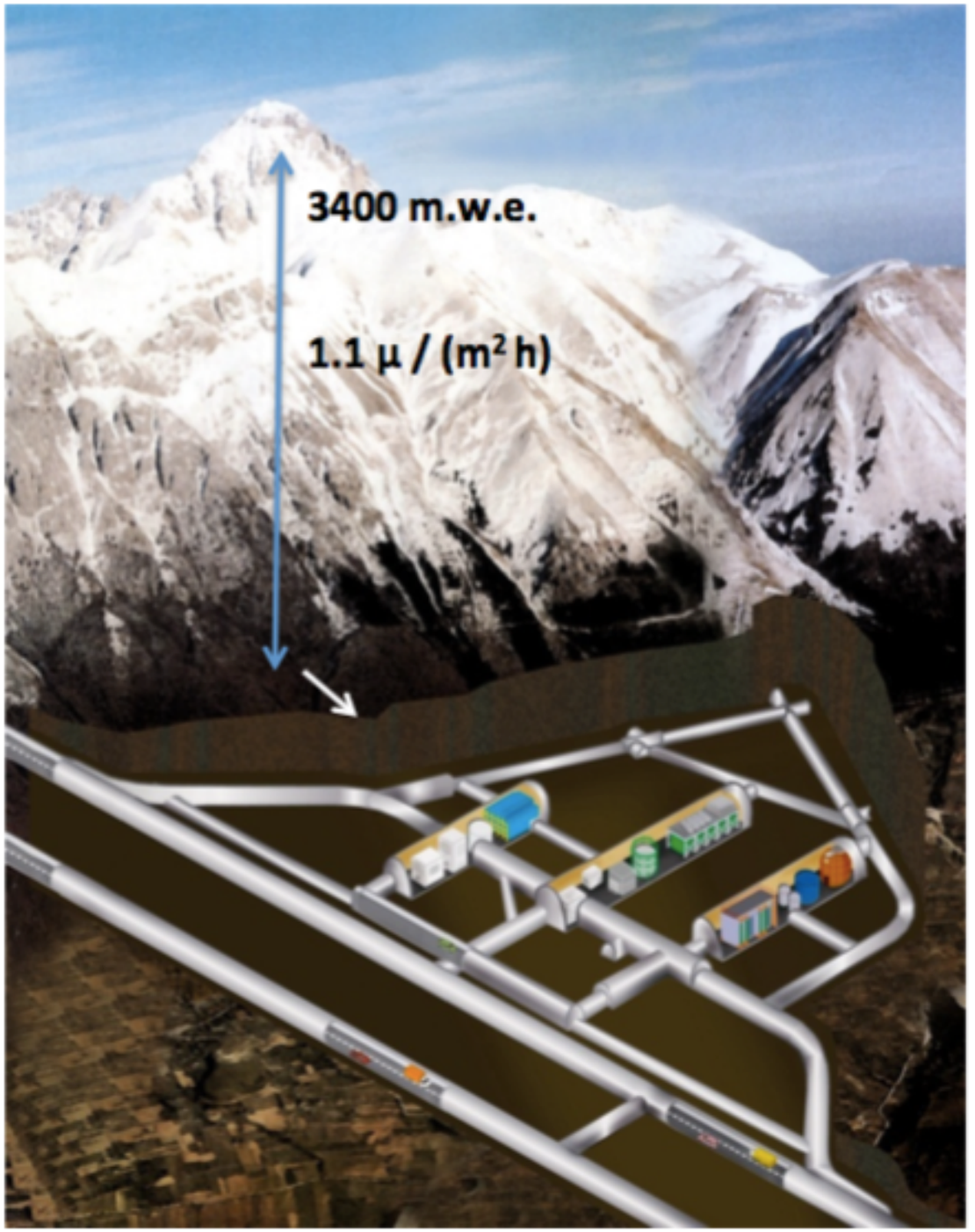
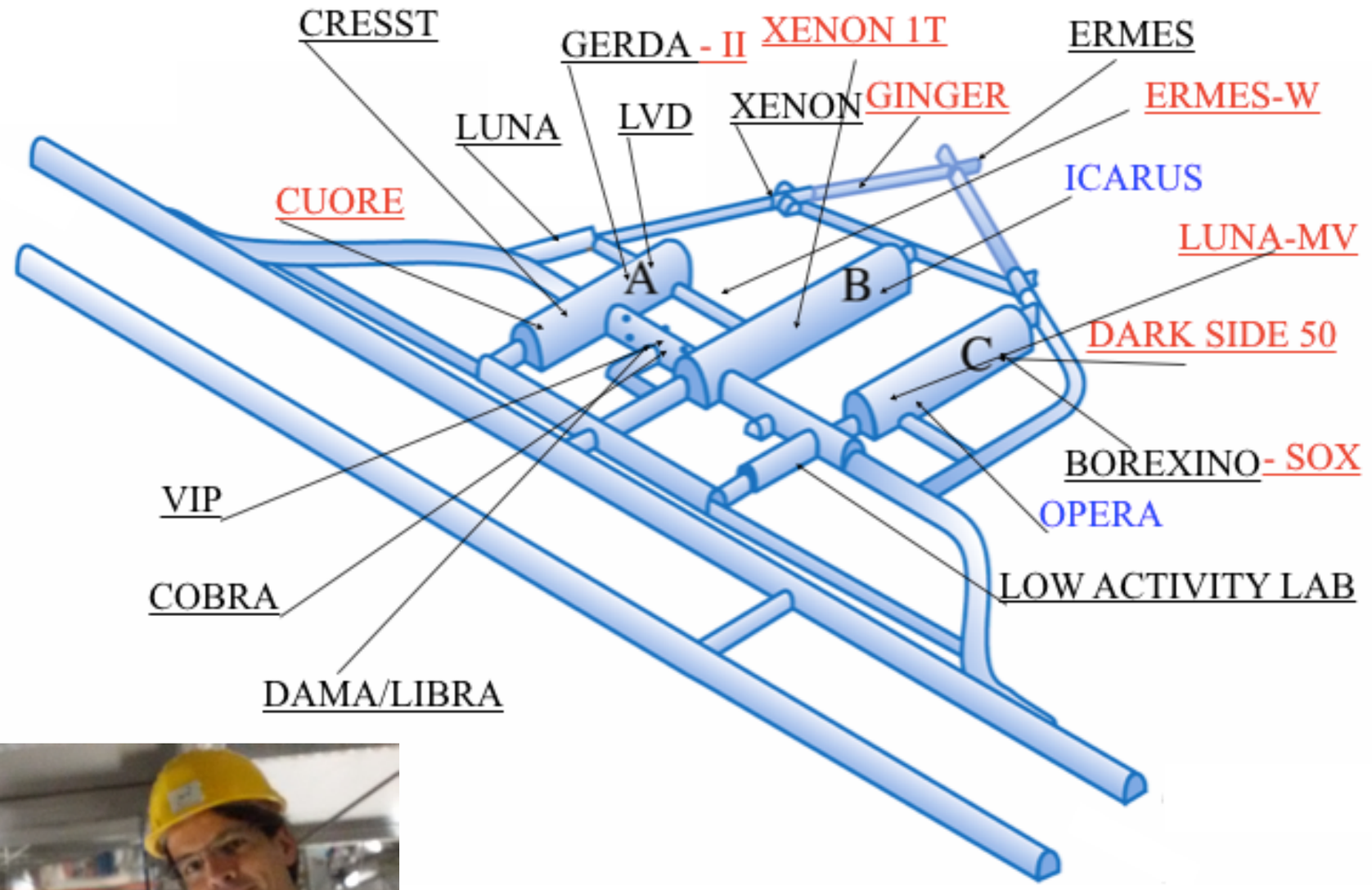
Laboratori Nazionali del Gran Sasso

- Muon flux: 3.0 10^{-4} $m^{-2}s^{-1}$
- Neutron flux:
  - 2.92 10^{-6} $cm^{-2}s^{-1}$ (0-1 keV)
  - 0.86 10^{-6} $cm^{-2}s^{-1}$ (> 1 keV)
- Rn in air: 20-80 Bq m^{-3}
- **Surface: 17 800 m^2**
- **Volume: 180 000 m^3**
- Ventilation: 1 vol / 3.5 hours
- **Mechanical Design and Workshop**
- **Electronics Lab & Service**
- **Chemistry Lab & Service**
- **ULB Lab & Service**
- > 900 users from 29 countries
- ~ 100 Staff
- 225 avg. daily presence in 2014
- ~ 8000 visitors/y
- Virtual tour via Street View



LNGS

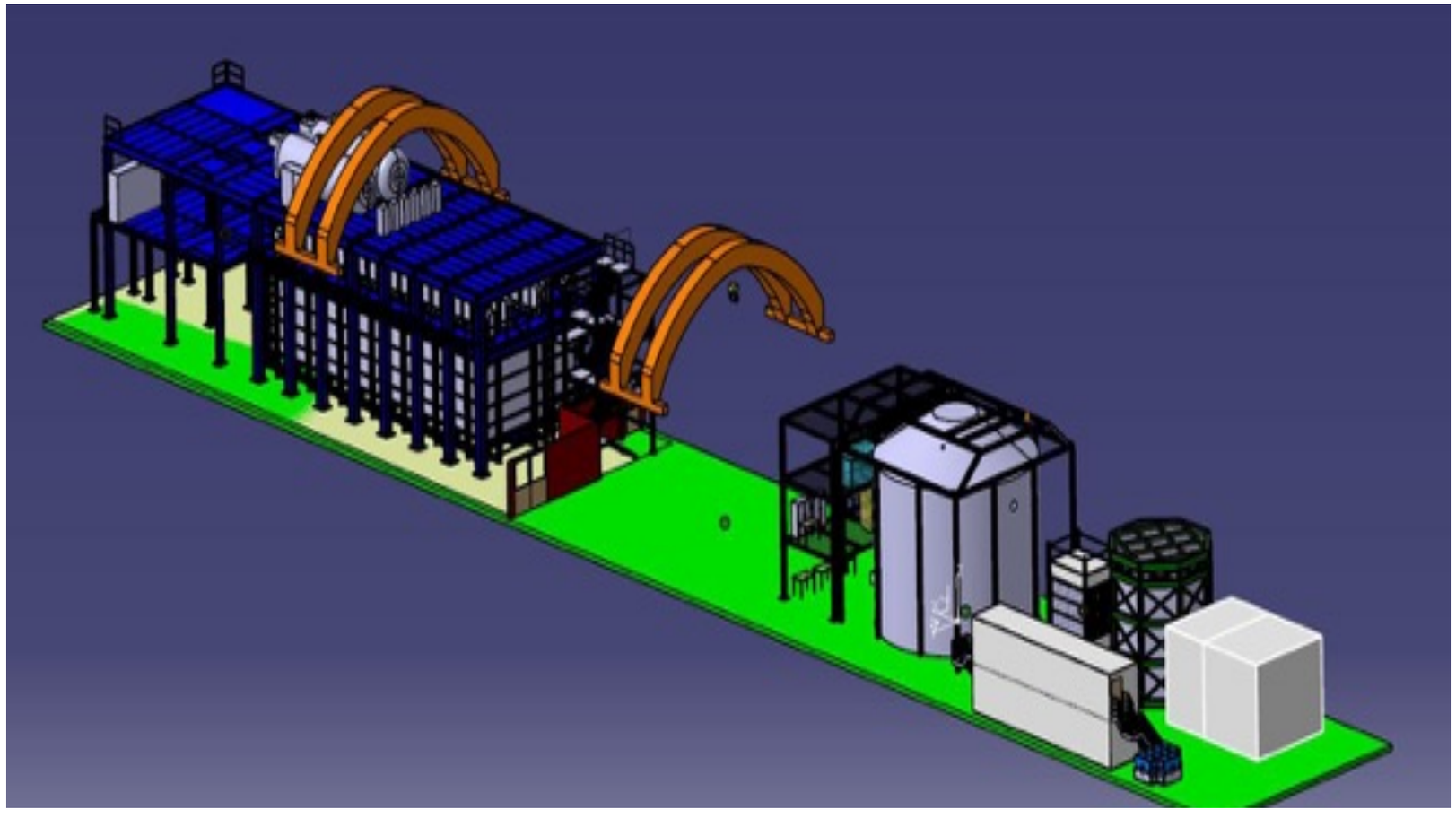
worm-like structure as CYGNUS-TPC would fit tunnels, without the need for big halls as other experiment



look at us contaminating XENON1T vessel!!!

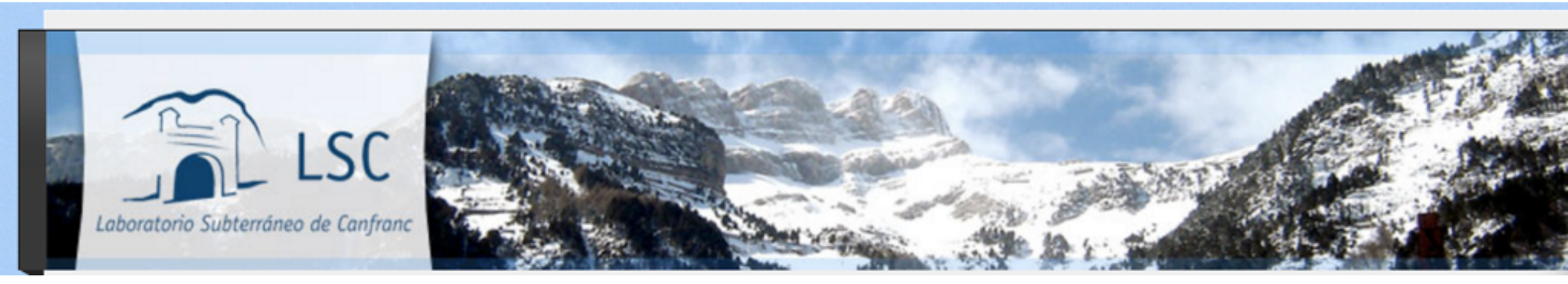
first stage would fit hall B

SF6 already considered for LUNA (i.e. security assessed), so shouldn't be a problem

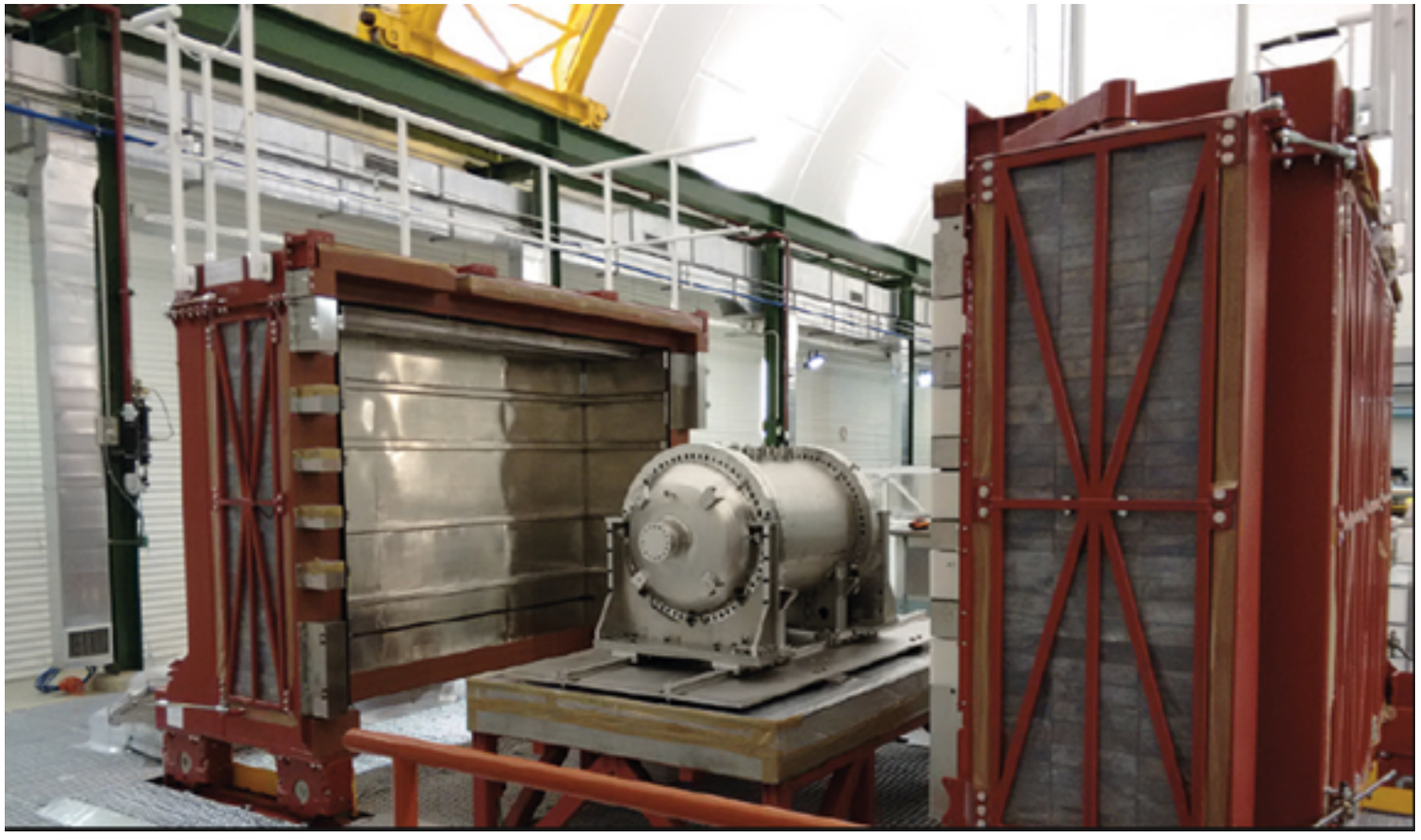


Spoken with P. Gazzana at LNGS (and with P. Gorla at IDM): we need to write a couple 2-3 pages vaguely describing what we want to do, with dimensions and requirement for the lab and present it (hopefully) by October scientific committee meeting

A possible new player: Canfranc?



e.g. NEXT experiment



Aldo Ianni, Canfranc director, came to me to propose this.

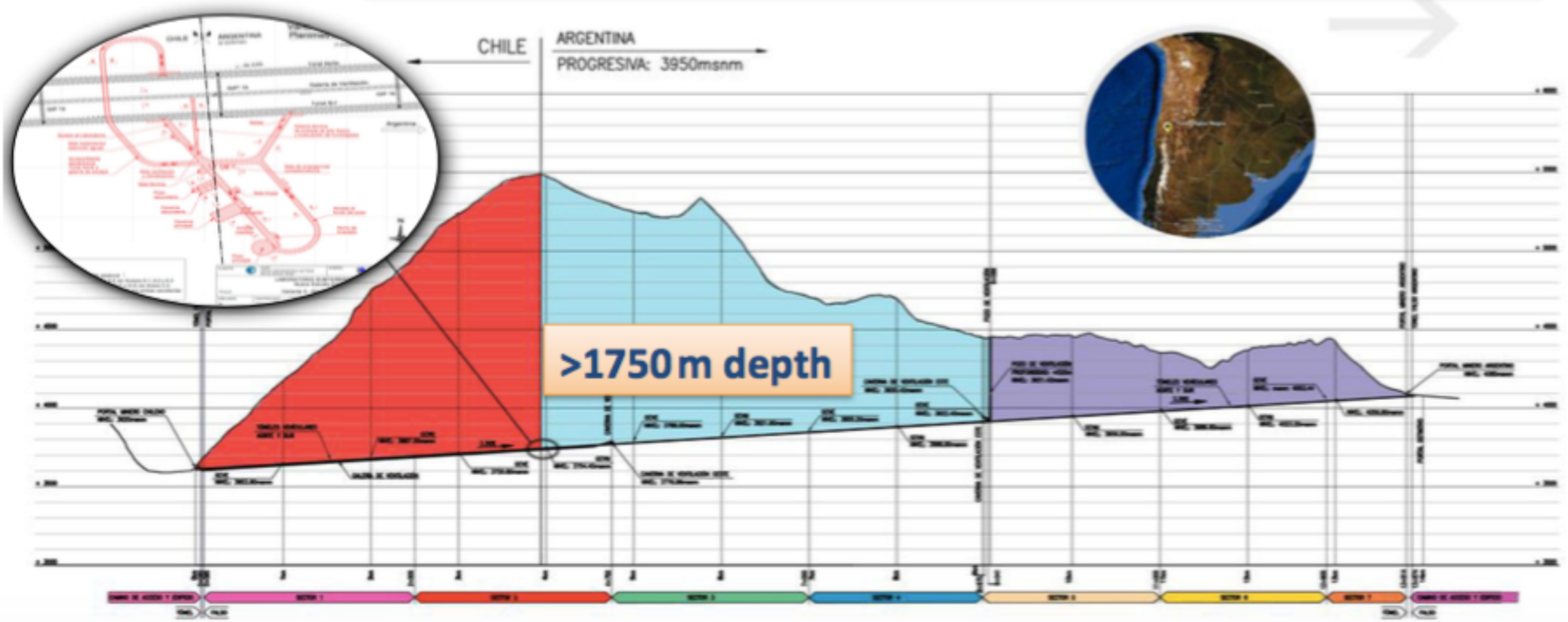
Space is available and he is fond of the idea of multiple site experiment

ANDES????????

ANDES
The Agua Negra deep underground laboratory

- Agua Negra tunnel between Argentina and Chile, linking MERCOSUR to Asia
- Laboratory location as deep as Modane
- Tunnel construction approved in August 2015; construction period 2016-2024
- Horizontal access, size of ~4 000 m^2 and ~70 000 m^3 in 8 halls and pits

Large and deep underground laboratory in the southern hemisphere



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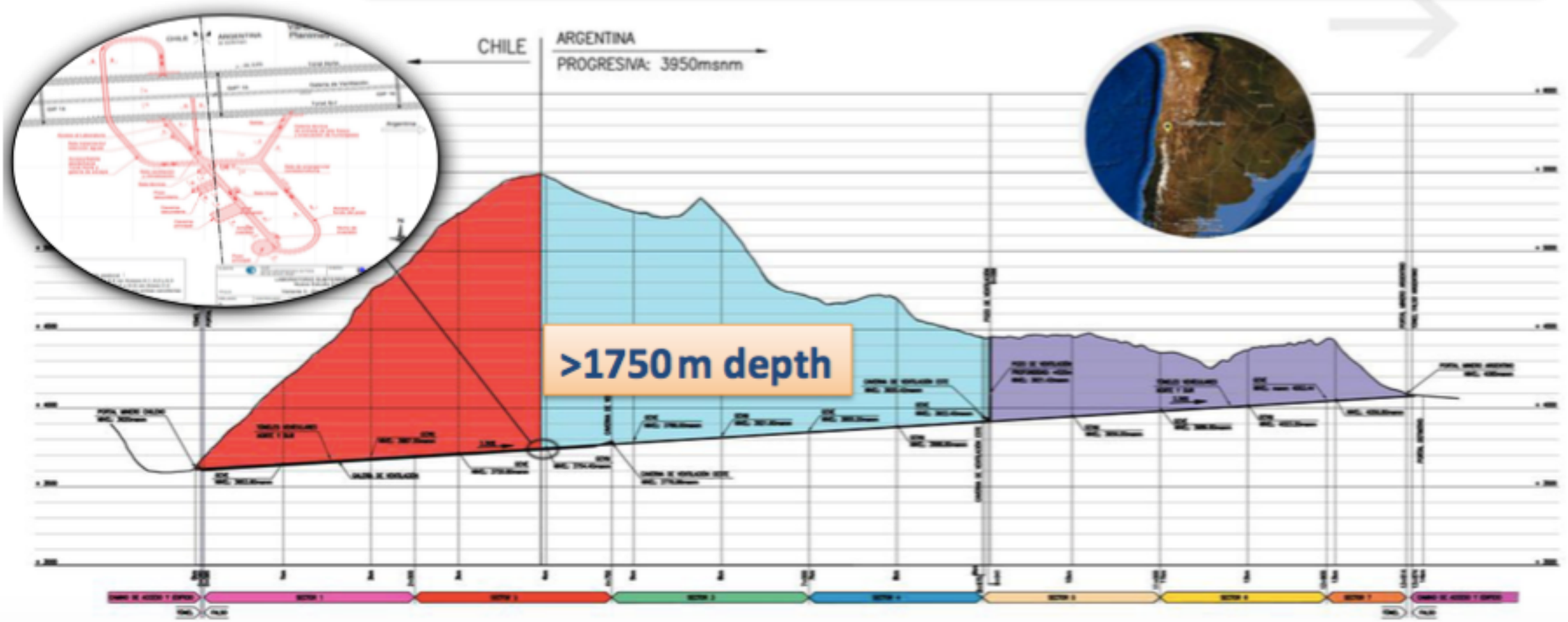
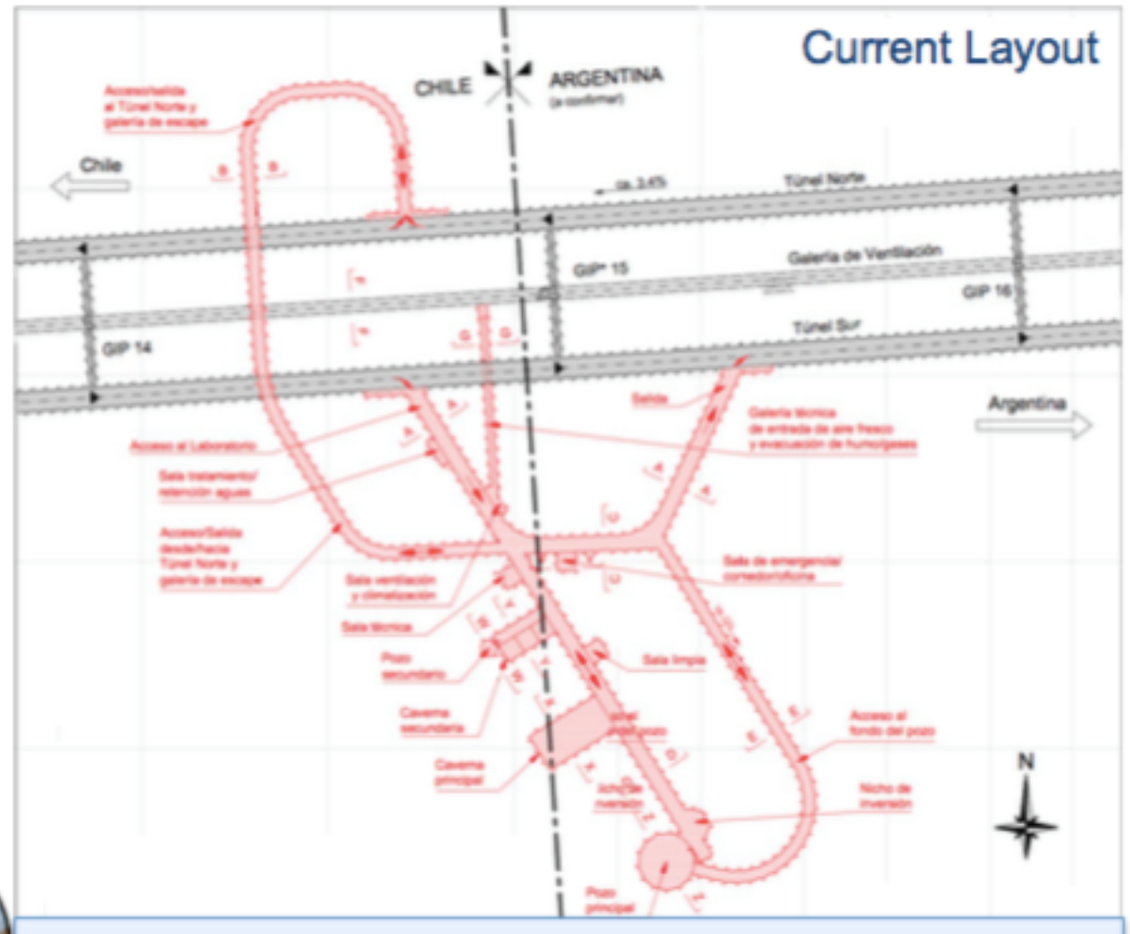


ANDES?????????

ANDES: Agua Negra Deep Experiment Site

- Main hall (21 m x 23 m x 50 m)
- Secondary hall (16 m x 14 m x 40 m)
- Offices and small labs
- Low radiation pit
- Large single experiment pit (~ ø 30 m, 30 m tall)
- Vertical depth: 1775 m, omnidirectional: 1675 m
- Total: 70 000 m^3 laboratory volume (+ 35 000 m^3 access tunnels)



Rock Studies (from test samples ~600 m deep)

Preliminary data (Bq/kg)

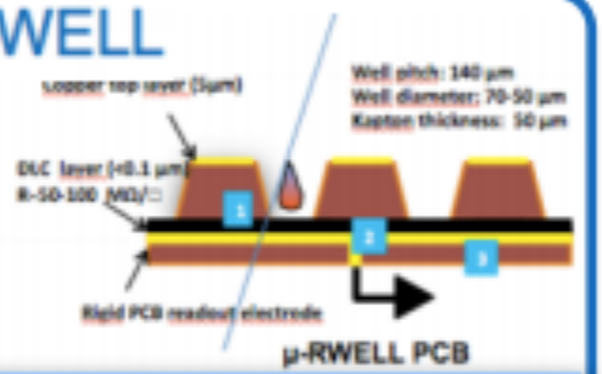
	Basalt	Andesite	Rhyolite 1	Rhyolite 2
^{238}U	2.6 ± 0.5	9.2 ± 0.9	14.7 ± 2.0	11.5 ± 1.3
^{232}Th	0.94 ± 0.09	5.2 ± 0.5	4.5 ± 0.4	4.8 ± 0.5
^{40}K	50 ± 3	47 ± 3	57 ± 3	52 ± 3

- ✓ Final exact location to be determined once geology is better known
- ✓ Proposed as an International laboratory within Latin America
- ✓ Conceptual study finished by Lombardi in January 2015
- ✓ Detailed engineering ongoing

More information at http://andeslab.org/

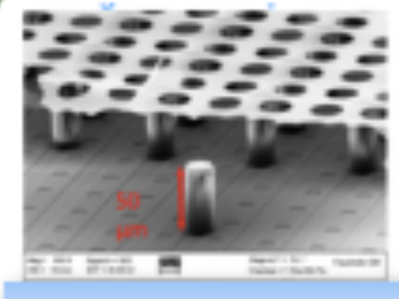
CYGNUS-RD project

μ-RWELL



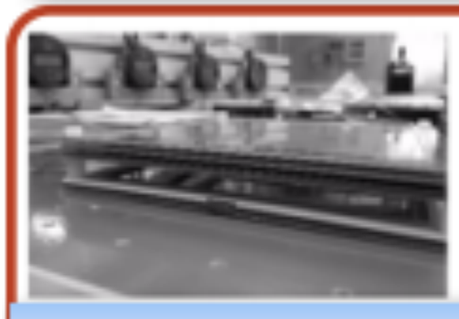
G. Bencivenni et al., JINST 10 P0 2008

GridPix



W. Koppert et al., NIM A 732, 245-249

Orange

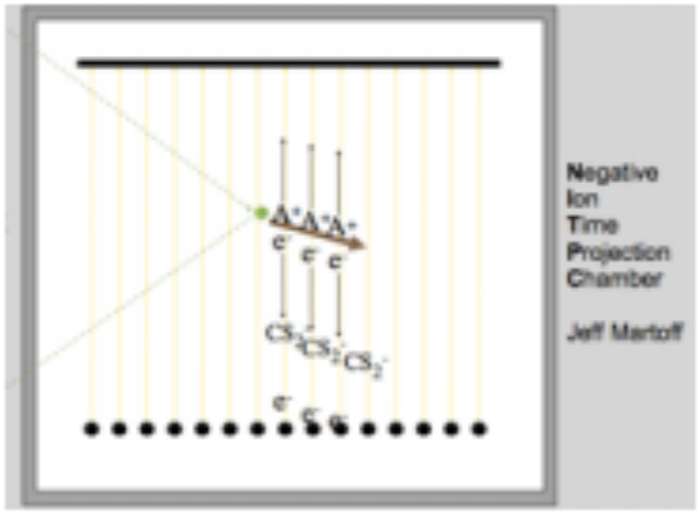


M. Marafini et al, JINST 10 No 12 P12010

GEMPix

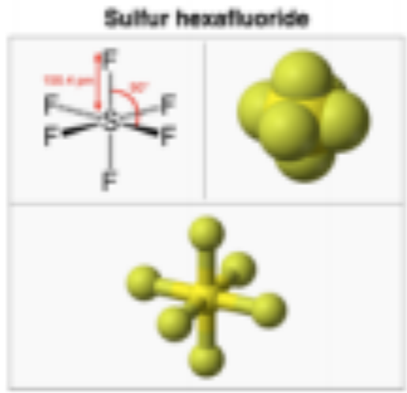
F. Murtas et al., JINST 9 C01058

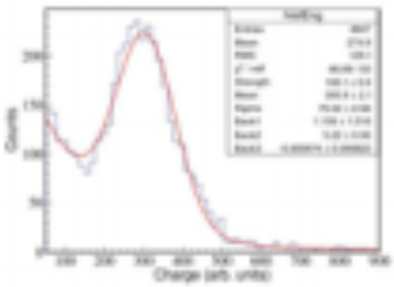
Negative Ions



- In an highly electronegative gas ionization electrons are capture at O(100) distance becoming anions
- Negative ion drift: anions as image carriers instead of electrons reduce longitudinal and transversal diffusion to thermal limit w/out magnetic field
- More than one anion species is created, allowing Z fiducialization with minority carrier time measurement

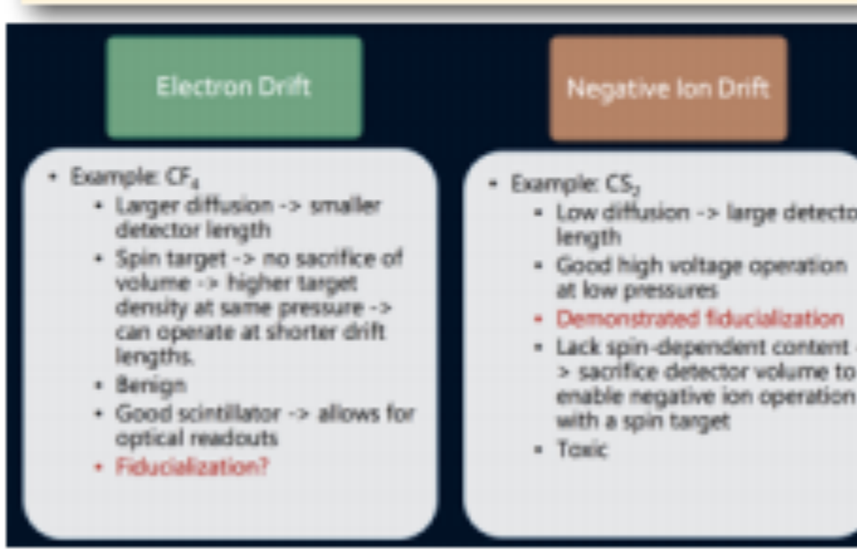
SF6 gas





(a) ^{55}Fe energy spectrum in 30 Torr SF_6 usi
0.4 mm THGEM

D. Loomba, thick GEMs (2015-2016), not yet published



CYGNUS-RD team, budget & context

Total budget ~50k EUROS

- Share NITEC and DCANT lab and vessel
- Patch panels (for each readout) ~8k EUROs
- Readouts: ~ 20 kEUROs (CMOS) + 10k EUROs (chips)
- Field cages ~10 kEUROs
- Vessel improvement ~5kEUROs
- Consumables (gas + orings) ~5 kEUROs
- Travel to Sheffield lab to test CS_2 ~2 kEUROs

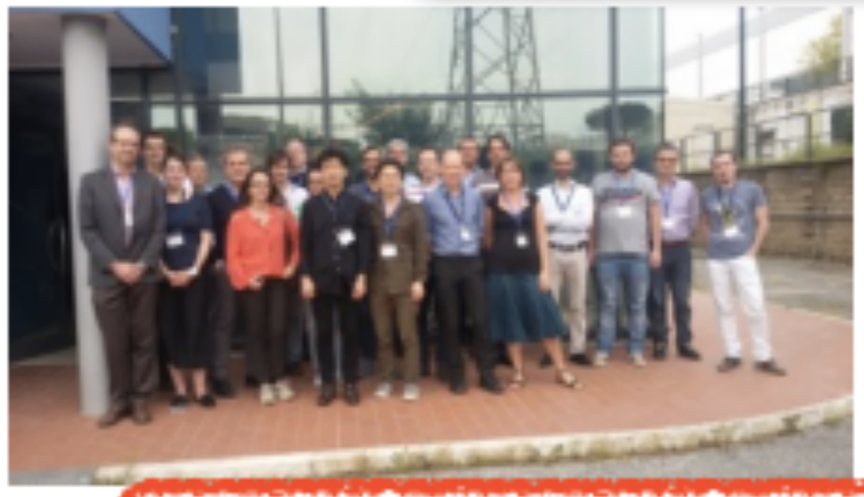
Team 1.6 (+1) FTE

- **Referente Scientifico: E. Baracchini**
- **Coordinatore Nazionale: XXX**
  - Sezione LNF: Coord. G. Mazzitelli 0.4 FTE, A. Tomasini 0.2 FTE, (E. Baracchini 1 FTE)
  - Sezione Roma1: Coord. XXX, G. Cavoto, D. Pinci, F. Renga, C. Voena TOT 1 FTE

Richieste servizi

- LNF: Servizio disegno & progettazione meccanica della divisione ricerca ~0.2 FTE (A. Tomasini)
- LNF: Servizio elettronica ~0.1 FTE
- LNF: Supporto esperimenti ~0.1 FTE (A. Mengucci)
- BTF beam time (2 weeks per year)
- Use of LNF radioactive sources (^{55}Fe, neutron source)

CYGNUS-TPC project



(WP1) Directional Dark Matter Sensitivity
(WP3) High Resolution Readout and Electronics
(WP9) Gas studies and optimization