

CERN Introduction

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What does « CERN » stand for?

Européan
Européie pour la
Recherche
Recherche



What does « CERN » stand for?

European
Organization for
Nuclear
Research



A background image showing particle tracks in a detector, likely a bubble chamber or cloud chamber. The tracks are glowing blue and cyan, with a prominent curved track on the right side. The overall scene is dark, with the tracks providing the main source of light.

CERN

Who is it ?

Member states

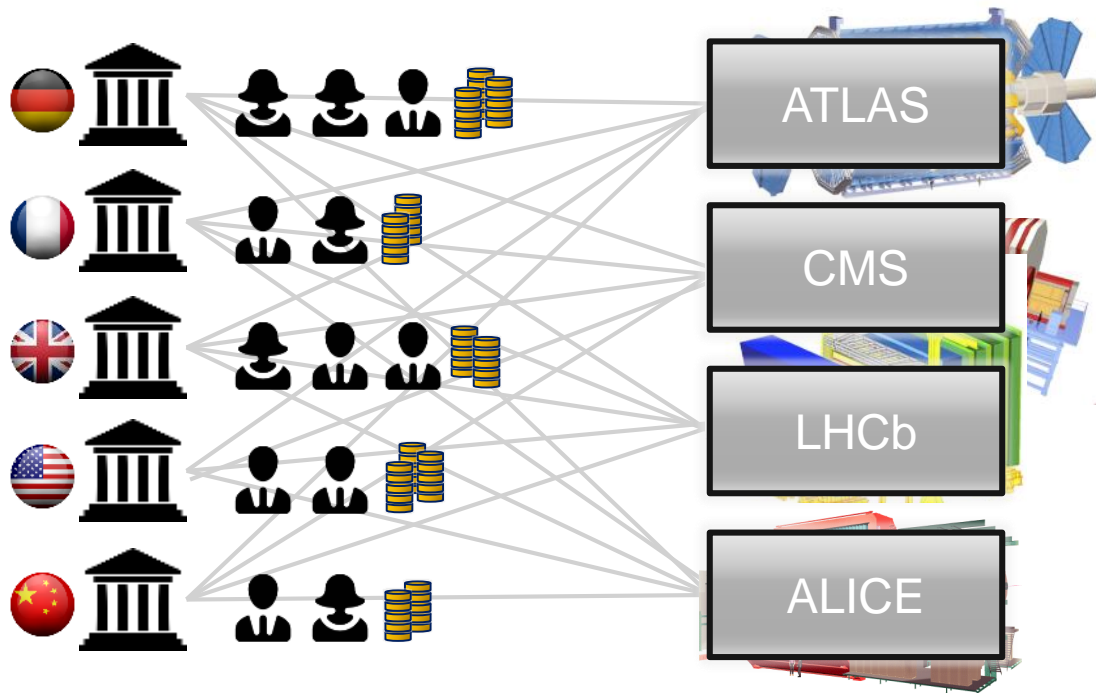


Ca 1 Bn CHF



Germany		20.52%	
United Kingdom		14.65%	
France		14.61%	
Italy		11.04%	
Spain		7.61%	
Netherlands		4.74%	
Switzerland		4.03%	
Norway		2.91%	
Poland		2.81%	
Sweden		2.78%	
Belgium		2.74%	
Austria		2.20%	
Denmark		1.75%	
Finland		1.37%	
Israel		1.42%	
Greece		1.32%	
Portugal		1.14%	
Czech Republic		0.98%	
Romania		0.98%	
Hungary		0.61%	
Slovakia		0.49%	
Bulgaria		0.29%	

Collaborations

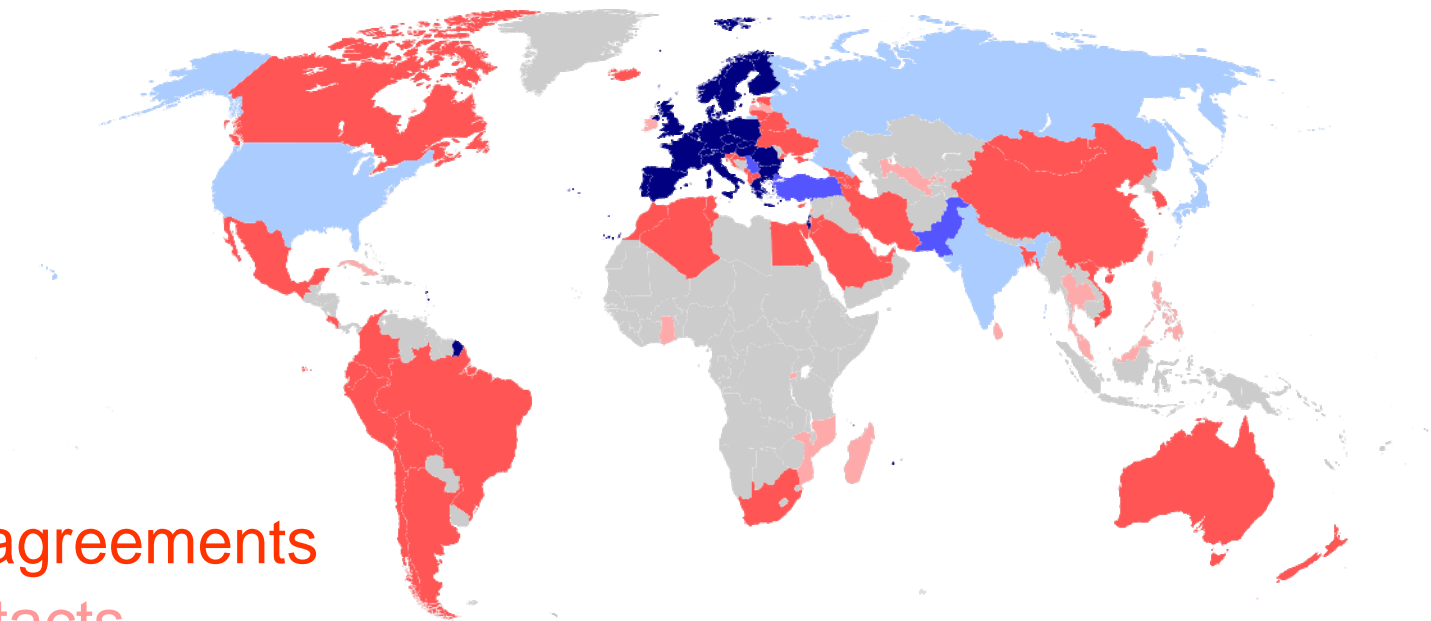


Global collaboration

22 members

3 associates

5 observers

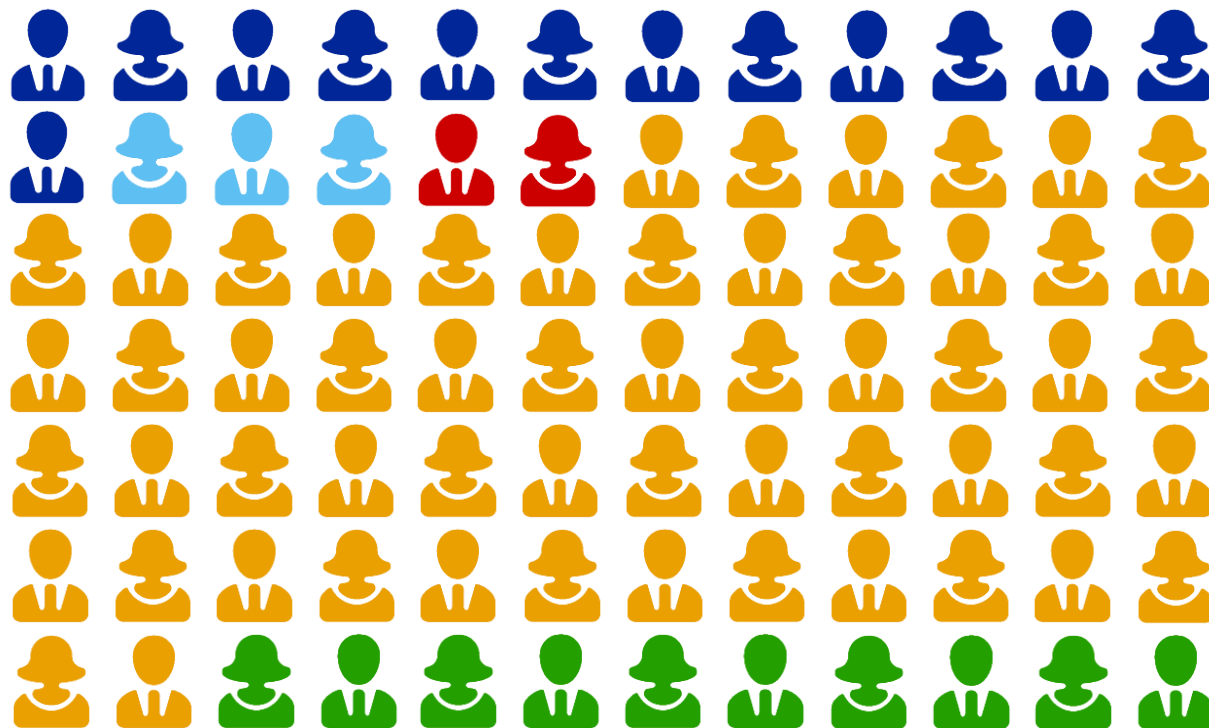


Cooperation agreements

Scientific contacts

How many people?

=+15'000



2'500 staff

600 fellows & apprentices

500 students

11'000 users

2'000 external companies

A background image showing particle tracks in a detector, likely a bubble chamber or cloud chamber. The tracks are glowing blue and cyan, with a prominent circular track on the right side. The overall scene is dark, with the tracks providing the main source of light and detail.

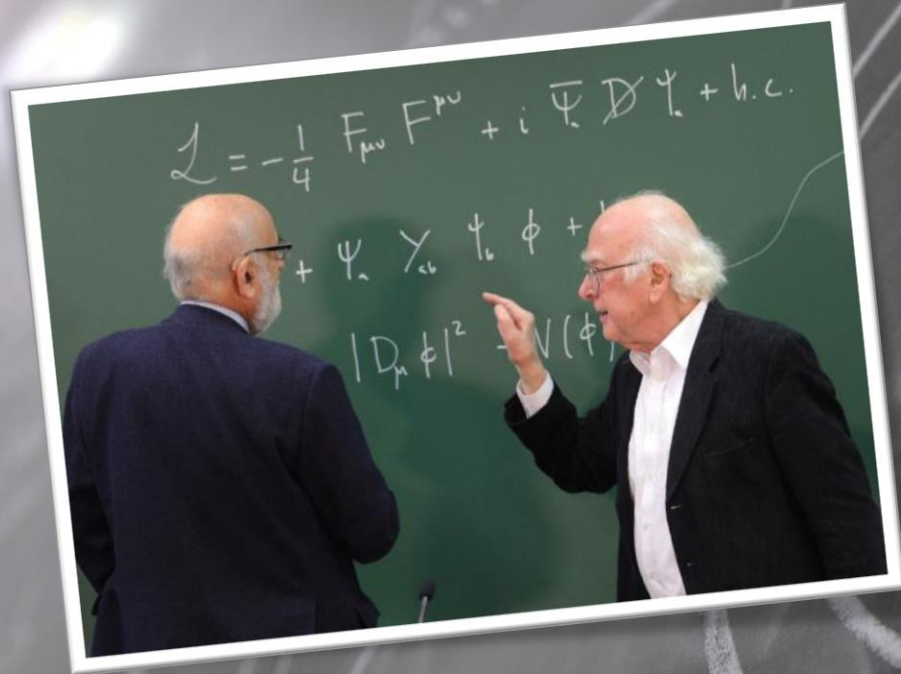
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What for ?

Fundamental research



Answering questions...



Higgs

Higgs ?

Answering questions...



Antimatter ?

Answering questions...

Dark matter ?

Collaborate



Educate



CERN

How does it work ?



Accelerating and colliding



Incredible levels of energy

$$-\frac{\hbar^2}{2m} \frac{d^2\psi}{dx^2} + V\psi = E\psi$$

$$E_f = \frac{m}{m_0} E_0$$

$$U = W_{AB} = |E_{pA} - E_{pB}| = |\varphi_A - \varphi_B|$$

$$v = \frac{wh}{2\pi r m_e}$$

$$\varphi_E = \frac{E_e}{\varphi_0} = k \frac{\varphi}{r}$$

$$m = N \cdot m_0 = \frac{Q}{v_e} \frac{M_m}{N_A}$$

$$E = \frac{E_c}{a} \int_{-a/L}^{+a/L} \sin(\omega t + \phi) dy$$

$$R_m = \frac{C}{T} k = \pm \sqrt{\frac{2m}{\hbar^2} (E - V_0)}$$

$$\omega = 2\pi f$$

$$E = mc^2$$

$$\beta = \frac{\Delta I c}{\phi_e} = \frac{\Delta E}{\Delta t} \frac{m_1}{X} + \frac{m_2}{X'} = \frac{m_2 - m_1}{v}$$

$$\vec{S} = \frac{1}{\mu_0} (\vec{E} \times \vec{B})$$

$$E_k = \frac{\hbar^2 k^2}{2m}$$

$$\oint \vec{D} \cdot d\vec{S} = Q^*$$

$$E = \hbar k^2 \quad 1 \text{ pc} = \frac{1 \text{ AU}}{c}$$

Accelerators chain

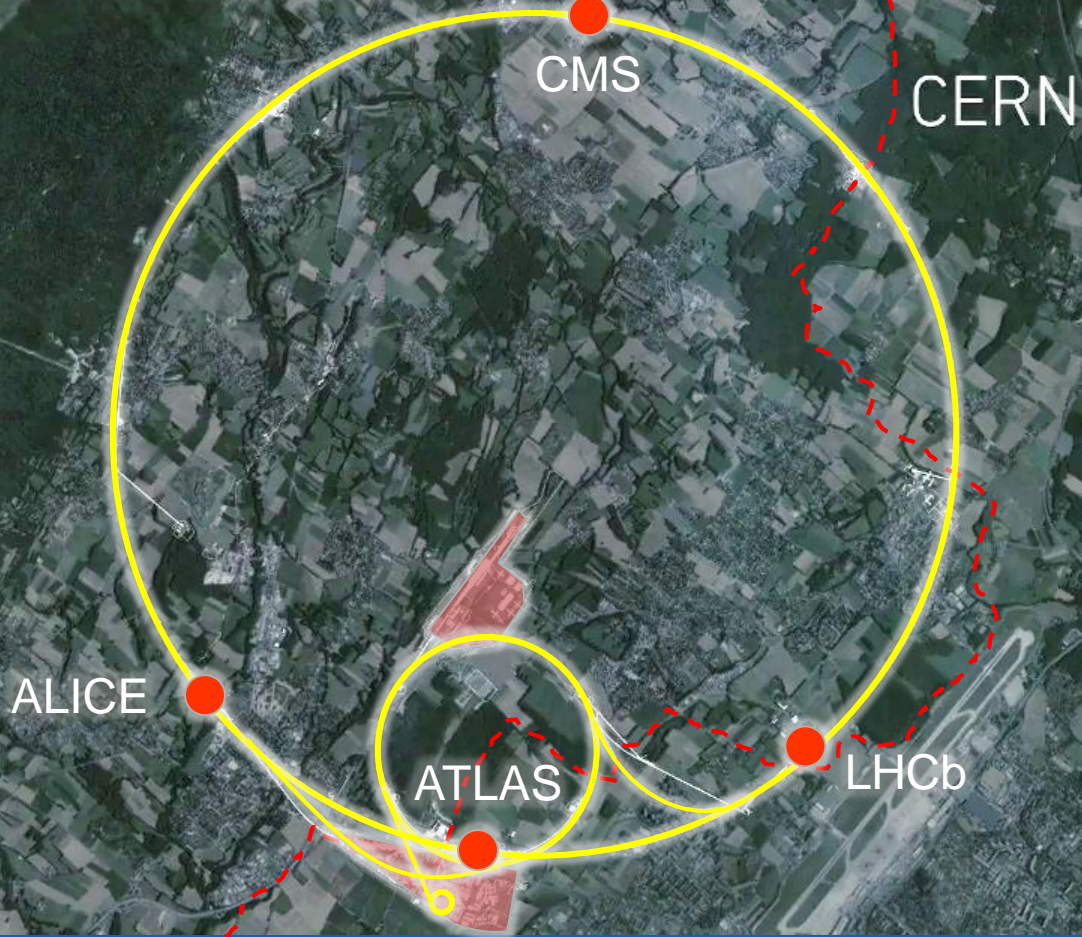



Million of collisions

A 3D rendering of a particle accelerator tunnel. Two red laser beams enter from the left and right, converging at a central point where they create a bright yellow spark, representing a collision. The tunnel is composed of various cylindrical and rectangular components, all rendered in a semi-transparent blue color. The background is a dark blue gradient.

25 ns bunch crossing
25 ns entre les paquets

Largest
scientific
experiment
on earth





The most
powerful
magnets

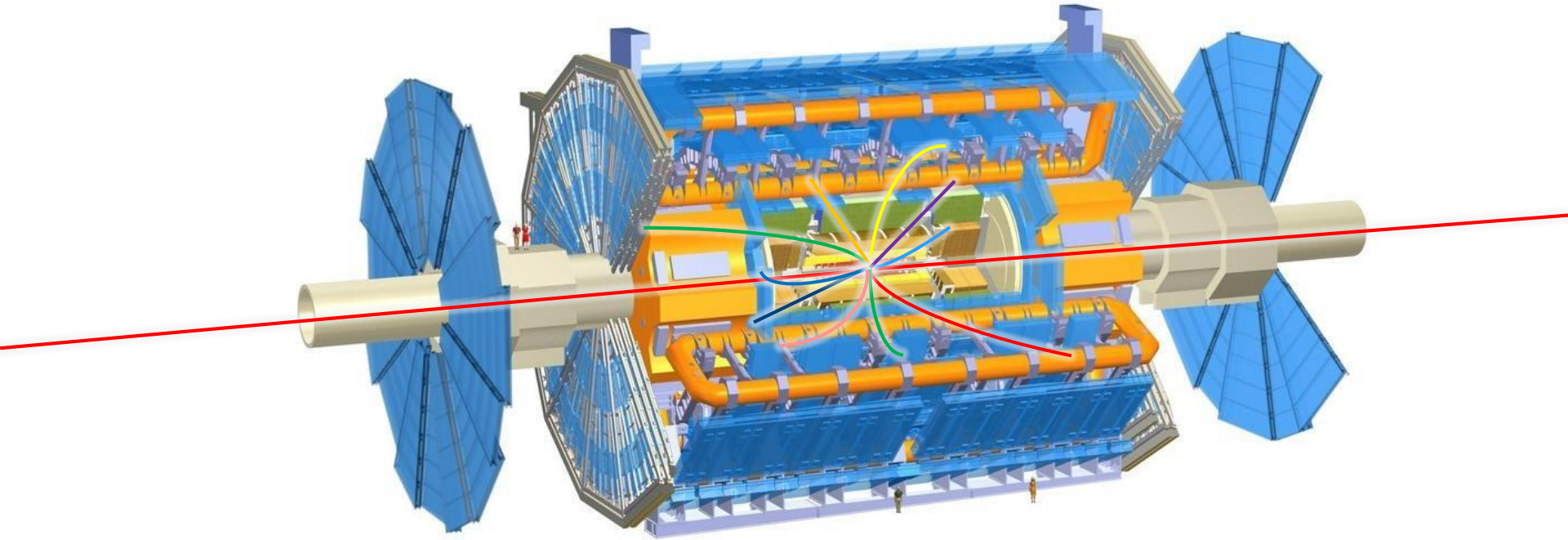


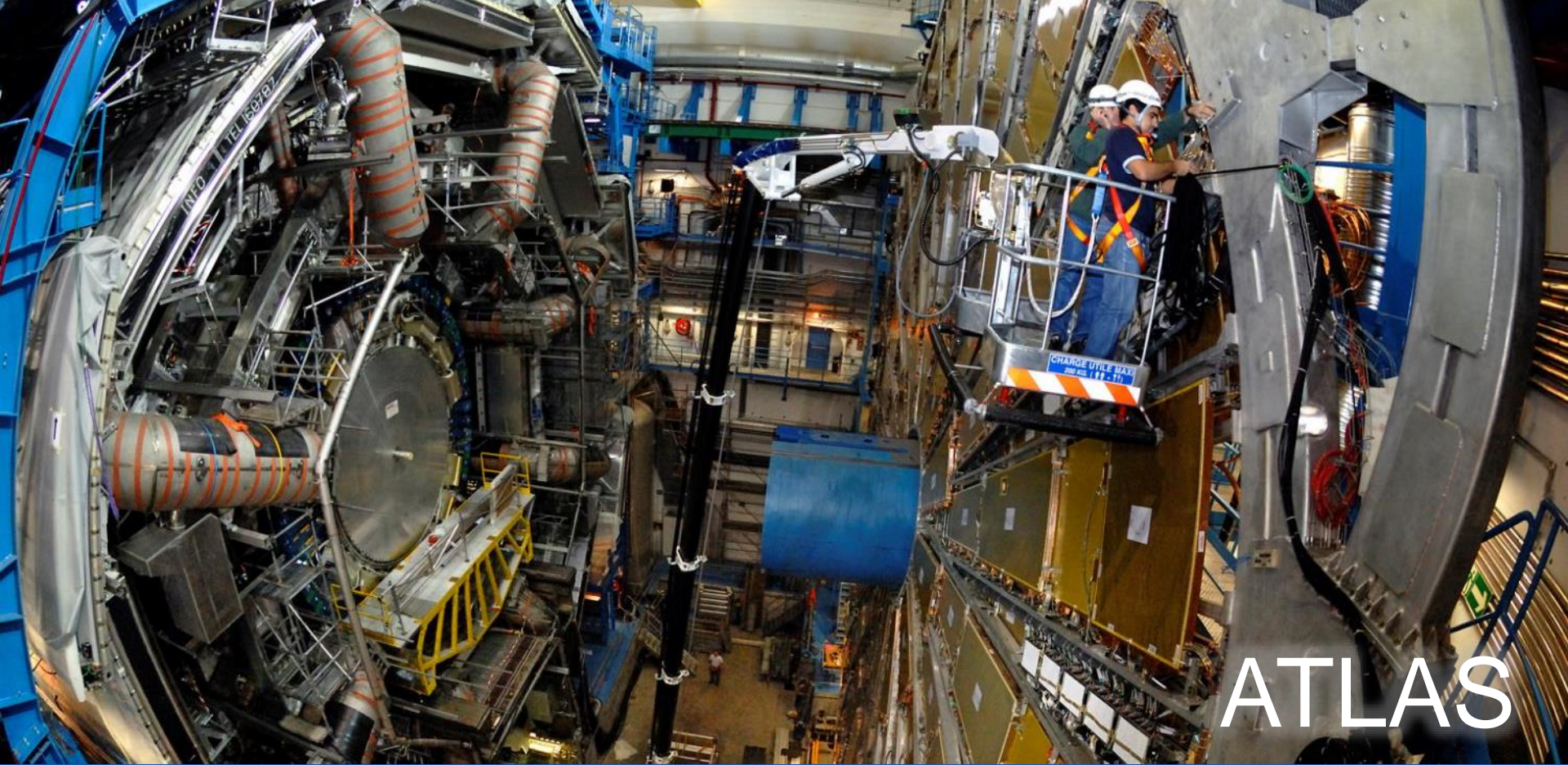
The highest vacuum



The
coldest
temperature

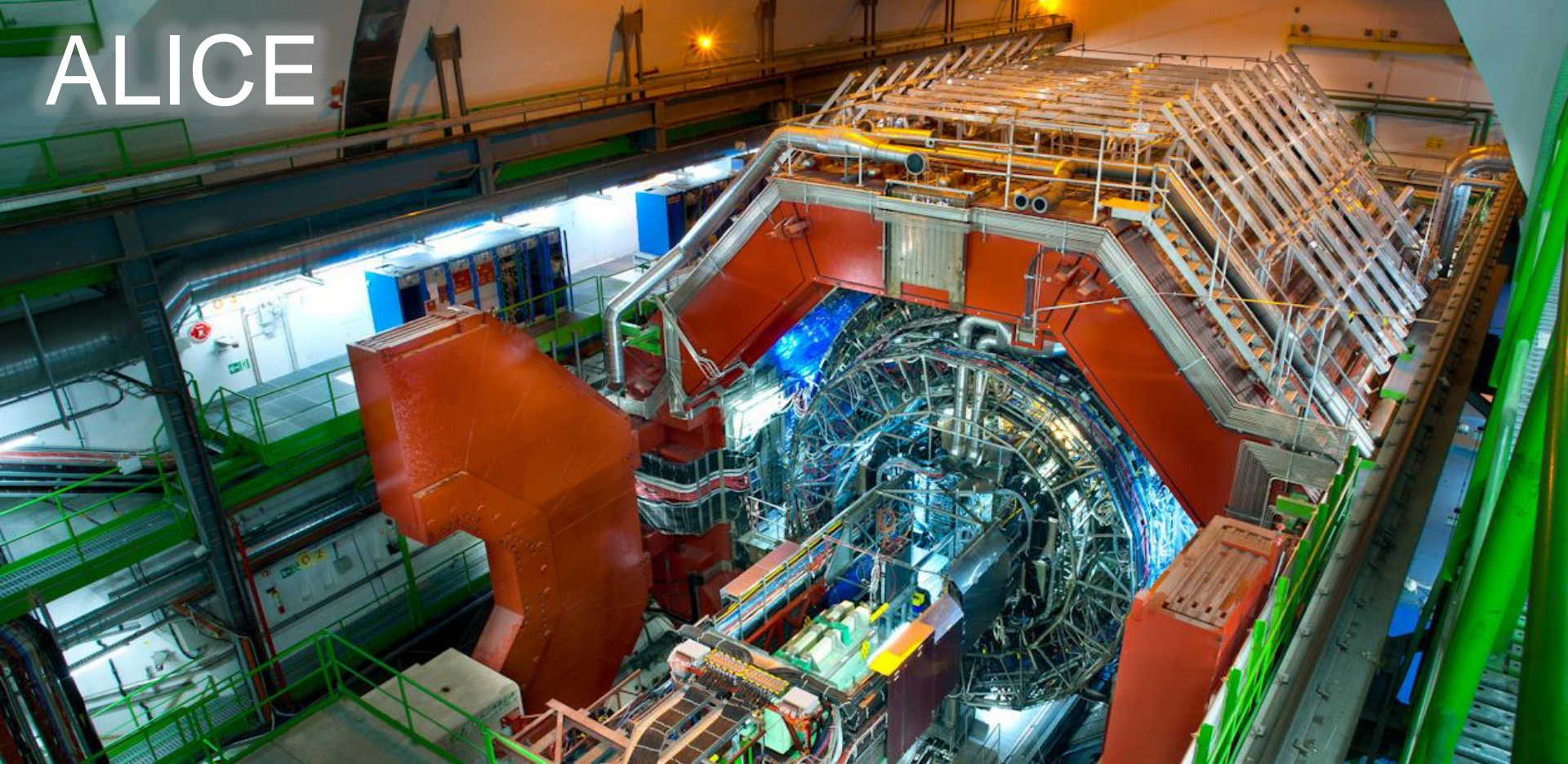
The largest detectors



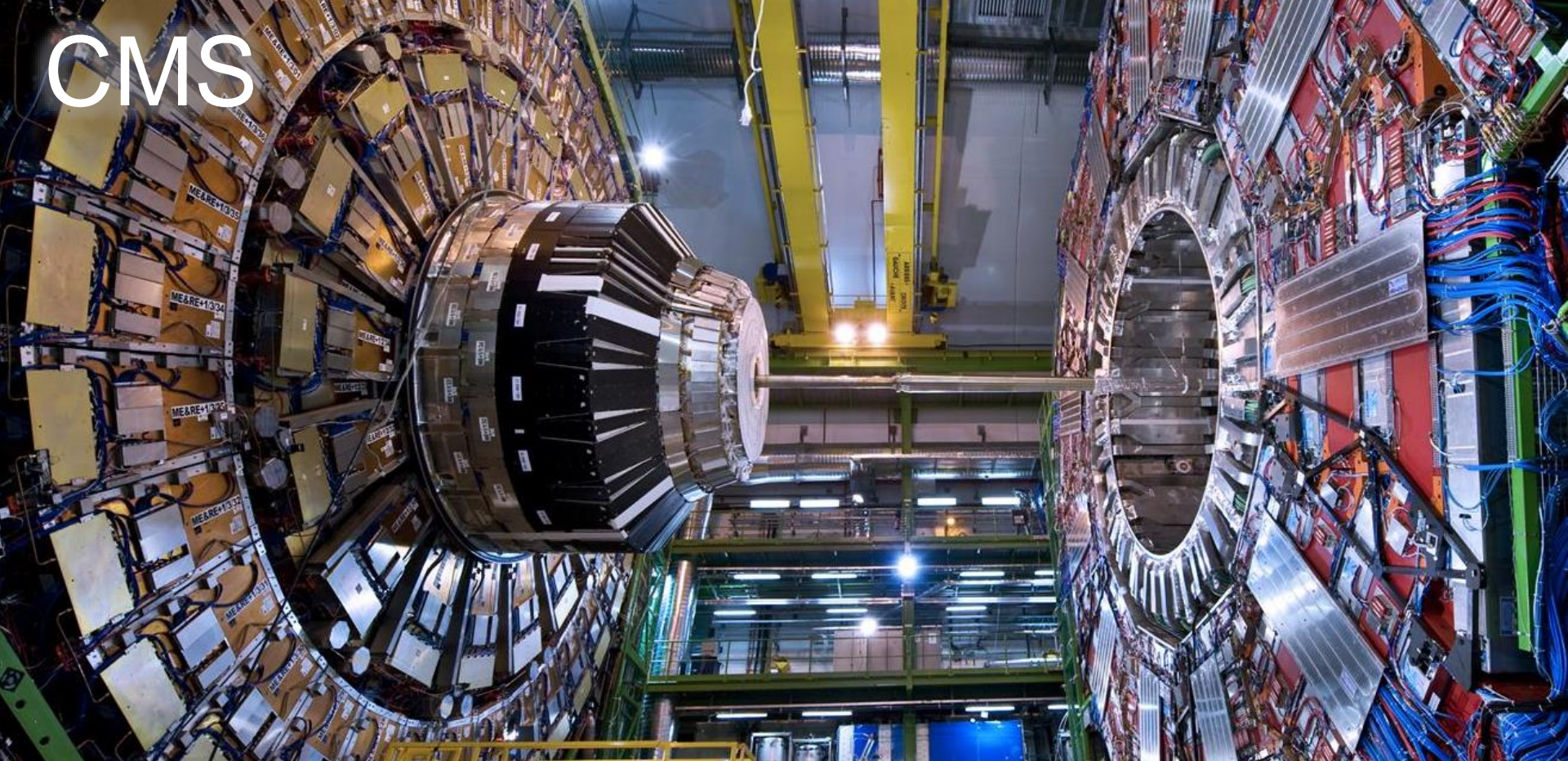


ATLAS

ALICE



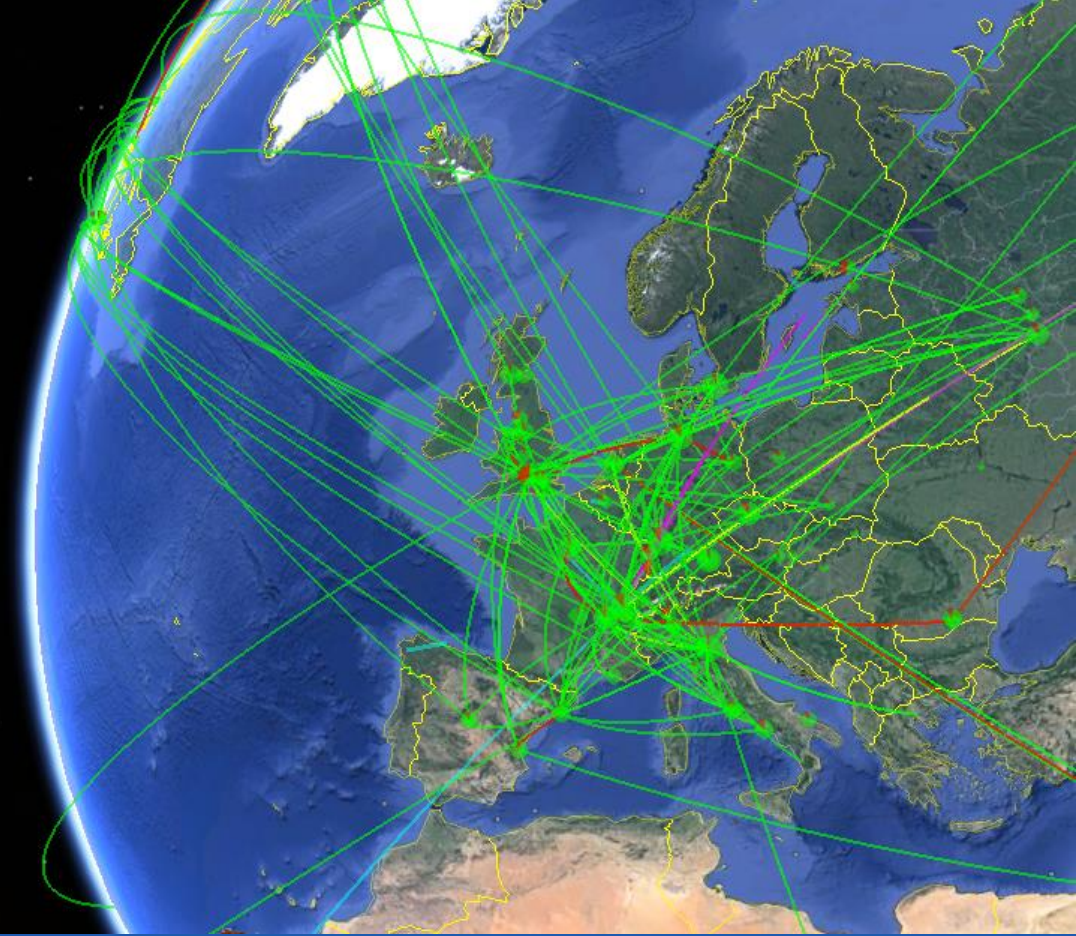
CMS





LHCb

The largest computing grid

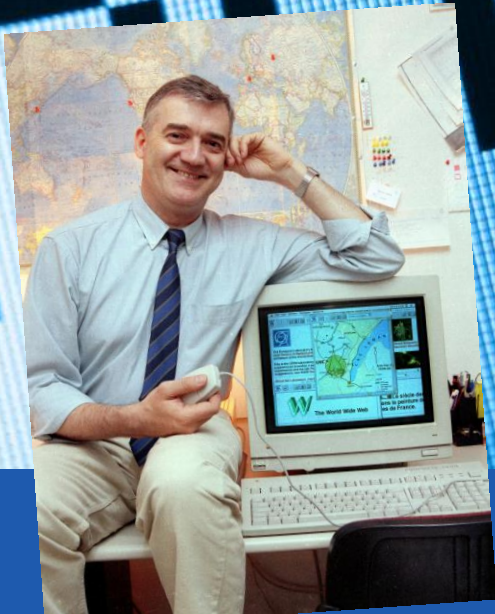


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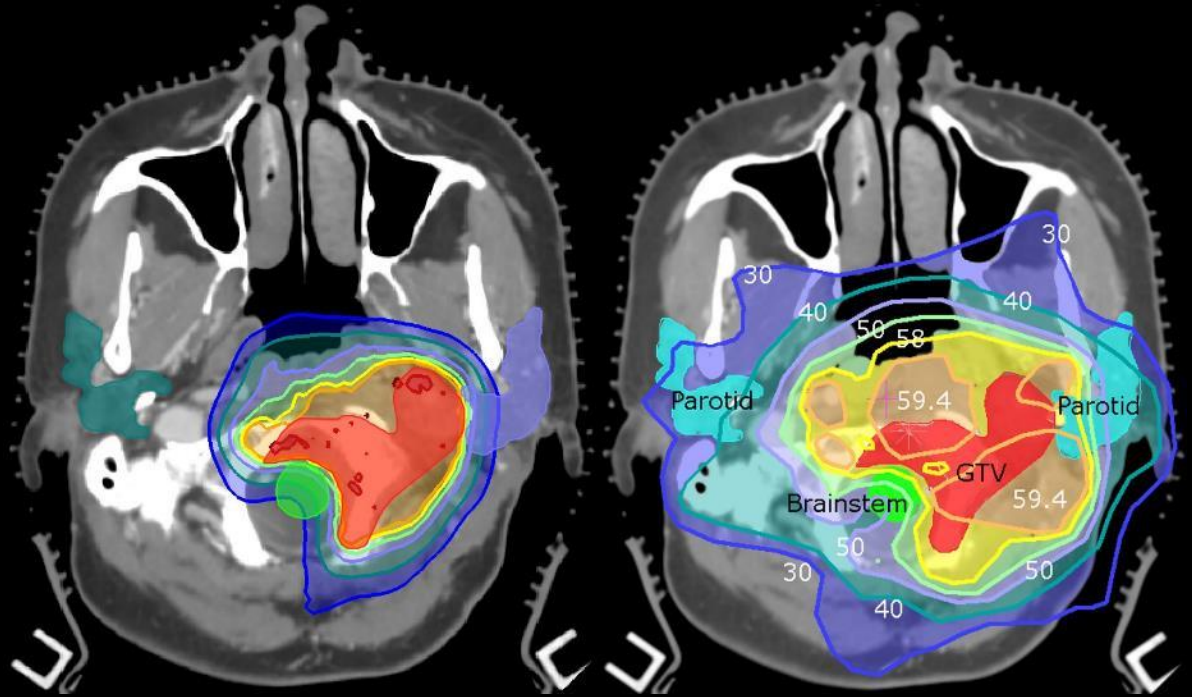
So what ?



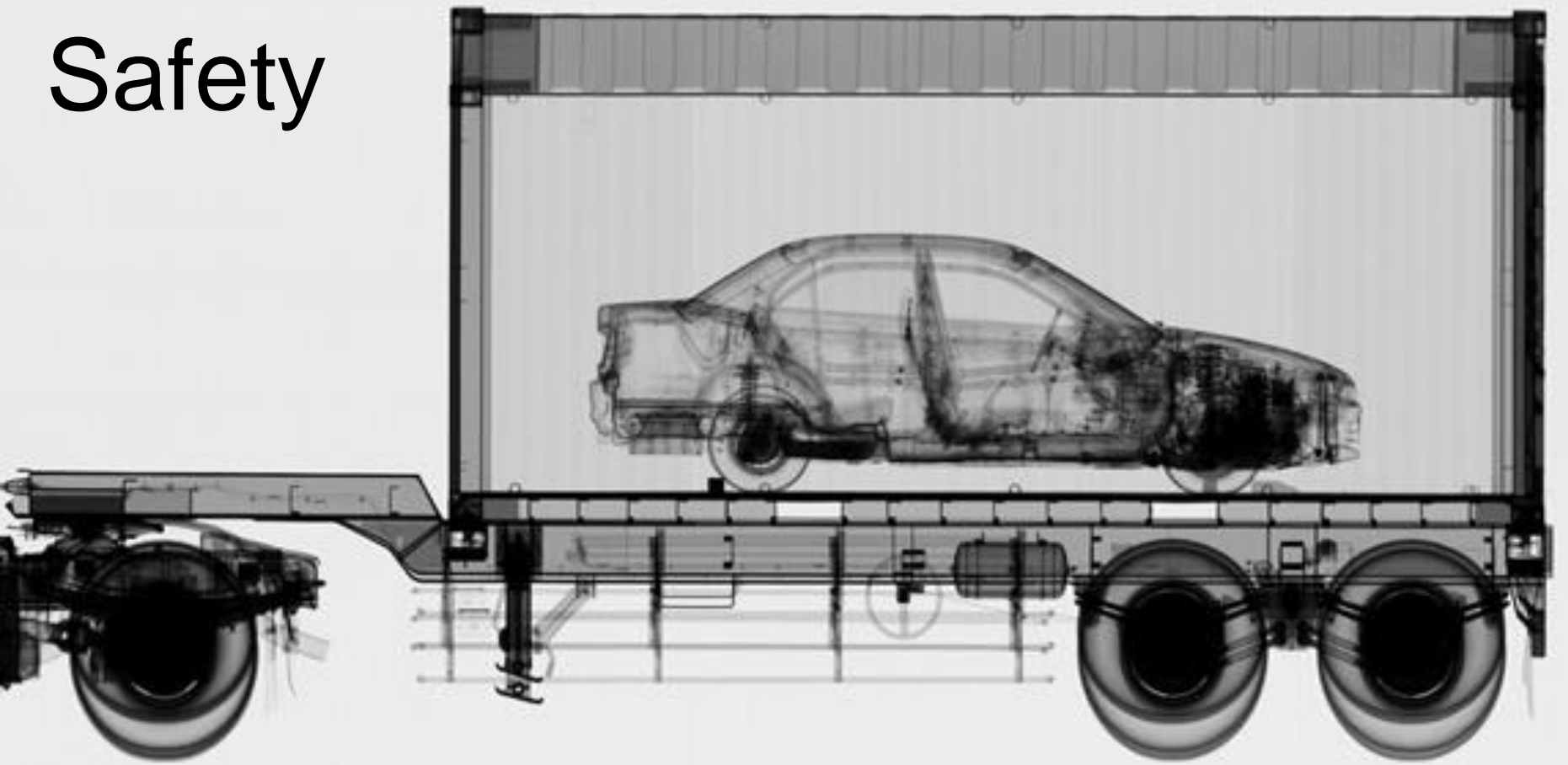
World Wide Web



Medical applications



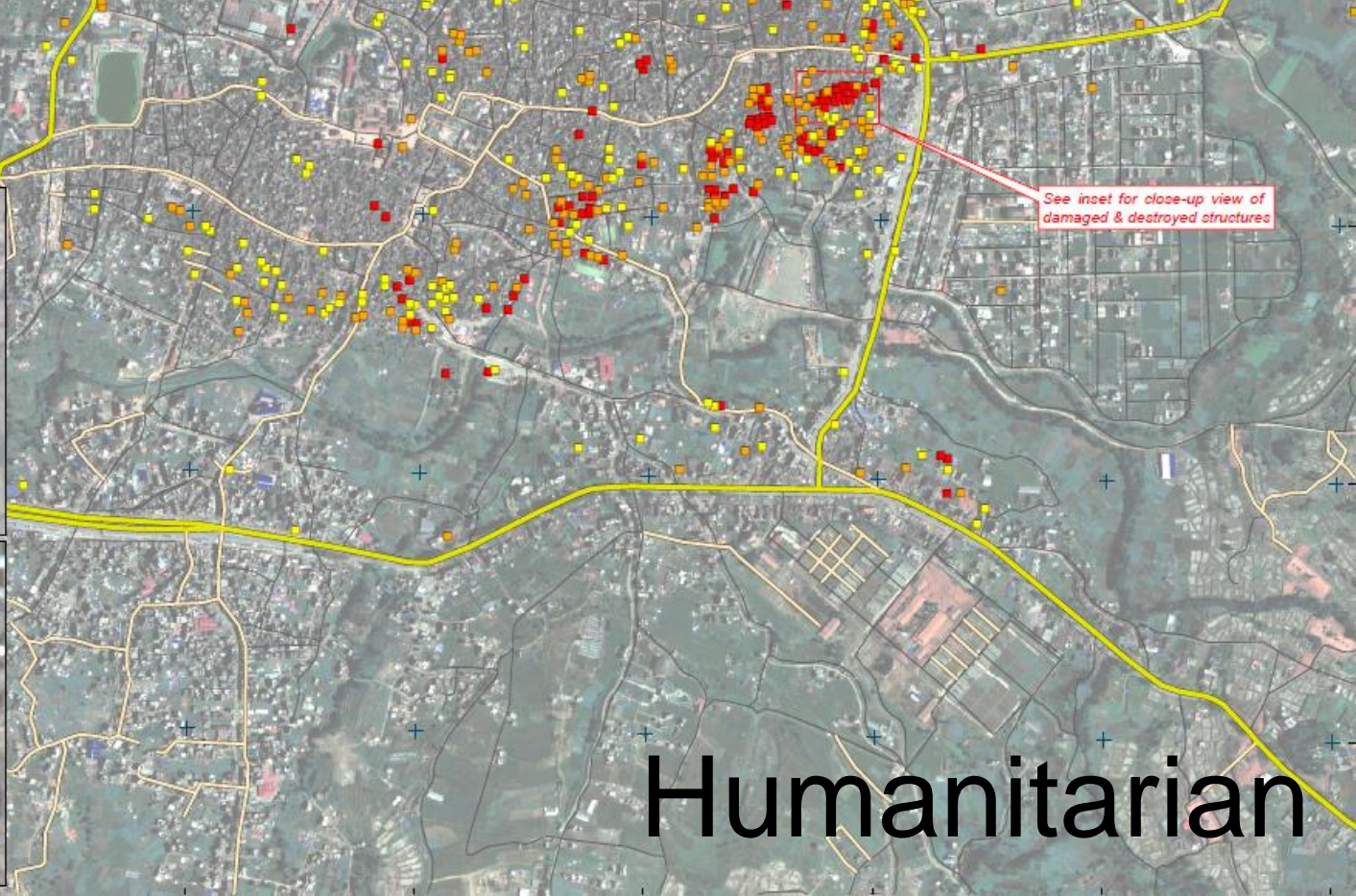
Safety



INSET: PRE-CRISIS



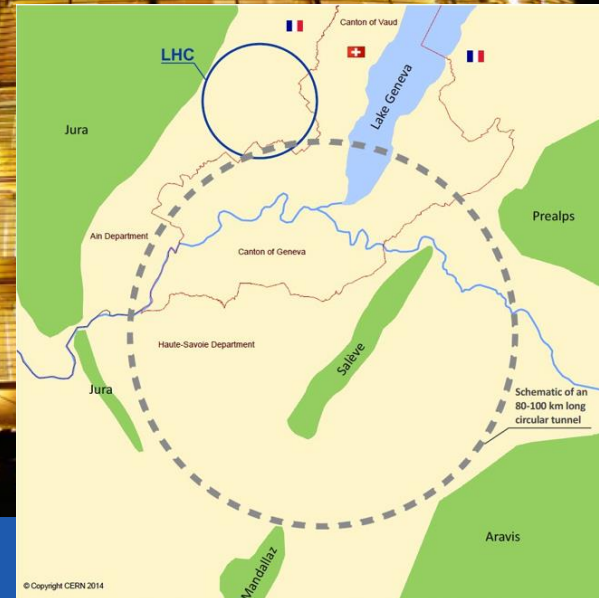
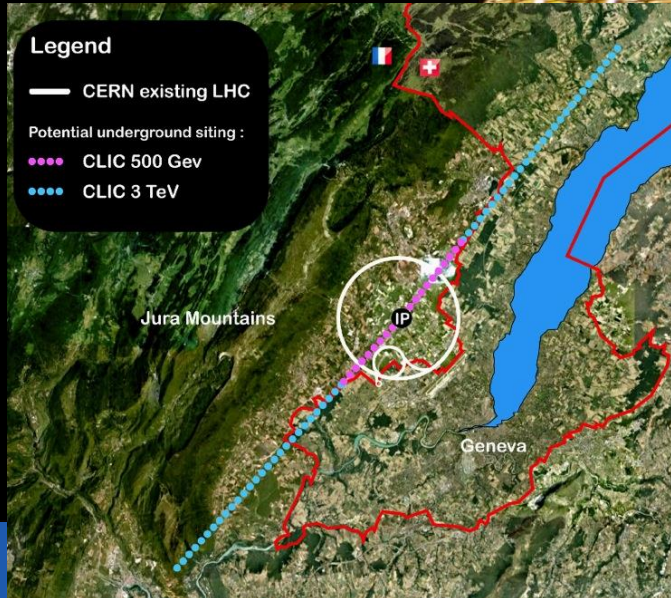
INSET: 27 APRIL 2015



Humanitarian

Future...?

- Compact Linear Collider (CLIC)
- Future Circular Collider (FCC)





www.cern.ch