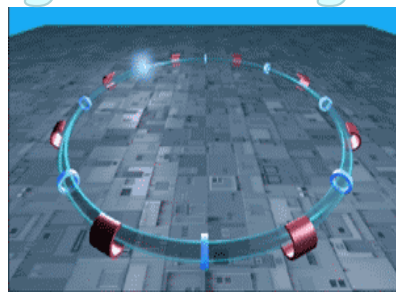




XIV Escola de Professores em Lingua Portuguesa



14th Portuguese Teachers School



CERN 2022



Bem Vindos



Introdução ao CERN e à Física de Altas Energias (HEP)

- A Organização
- O Laboratório
- Física de Altas Energias
- Os Aceleradores e as Experiências

**Isto e' uma "escola" portanto...perguntem!!
"Não há perguntas estúpidas"**

Programa da Escola :

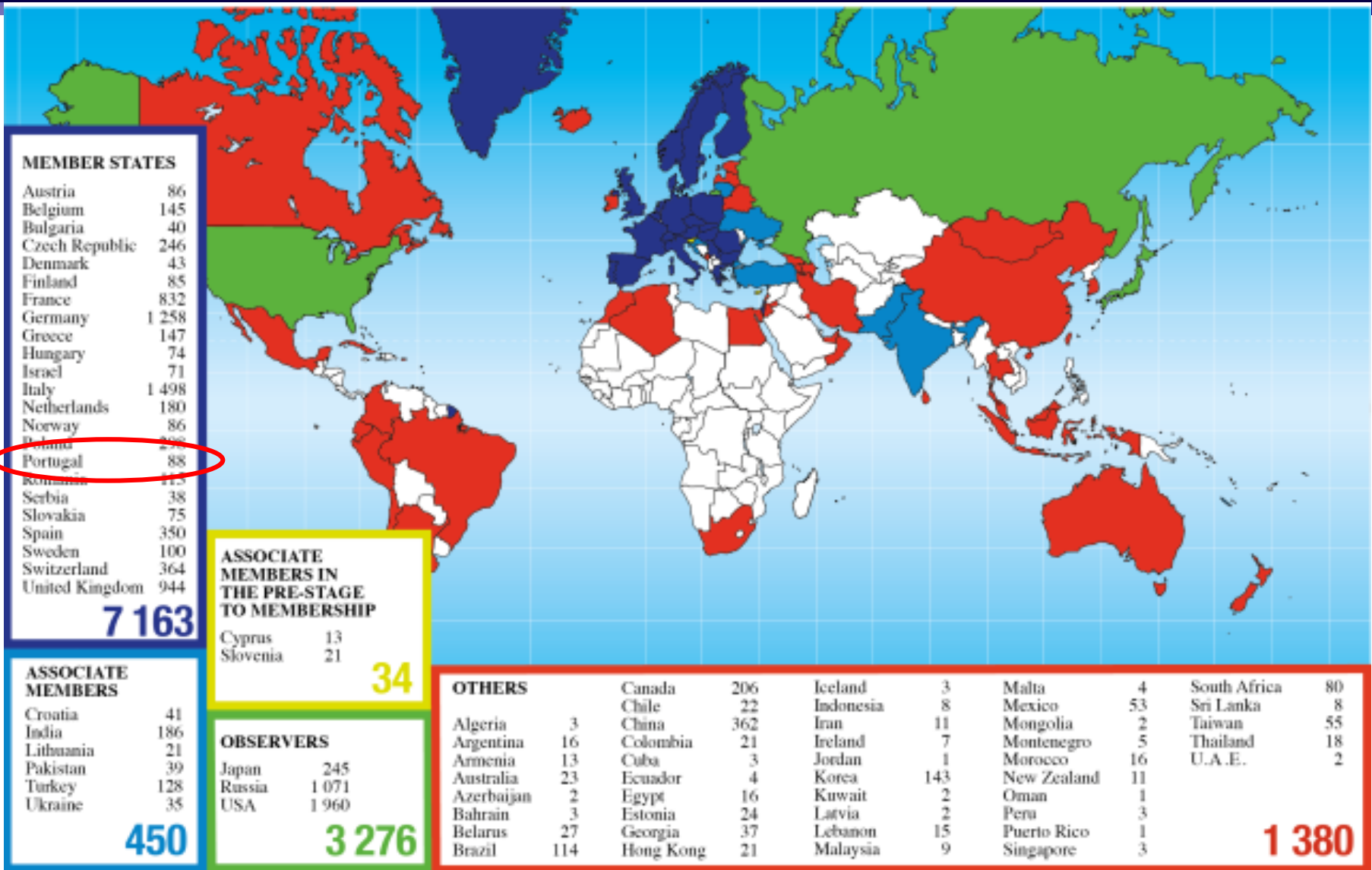
<https://indico.cern.ch/event/1087844/timetable/>

Página FACEBOOK (grupo) :

Escola de Professores no CERN em Lingua Portuguesa

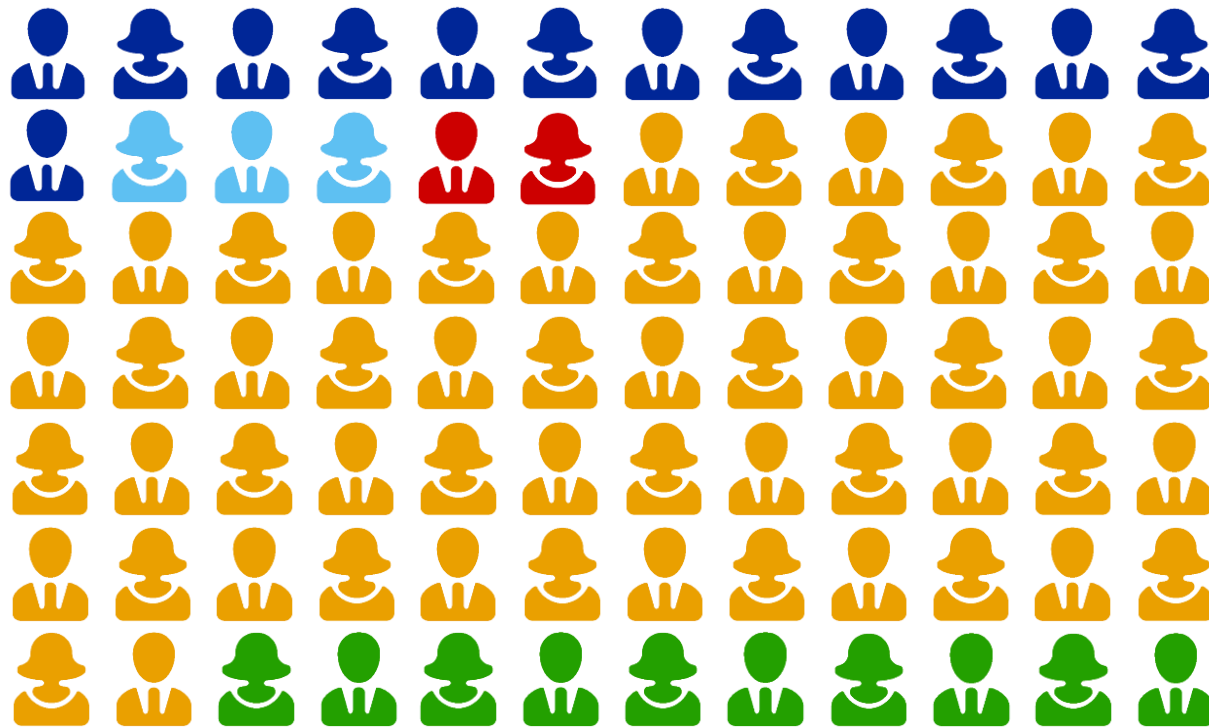
<https://www.facebook.com/groups/escolacern2013/>

Distribuição dos Utilizadores do CERN por país (em 2020) >13000 utilizadores



Quantas pessoas?

~15'000!



2'500 funcionários

600 fellows &
aprendizes

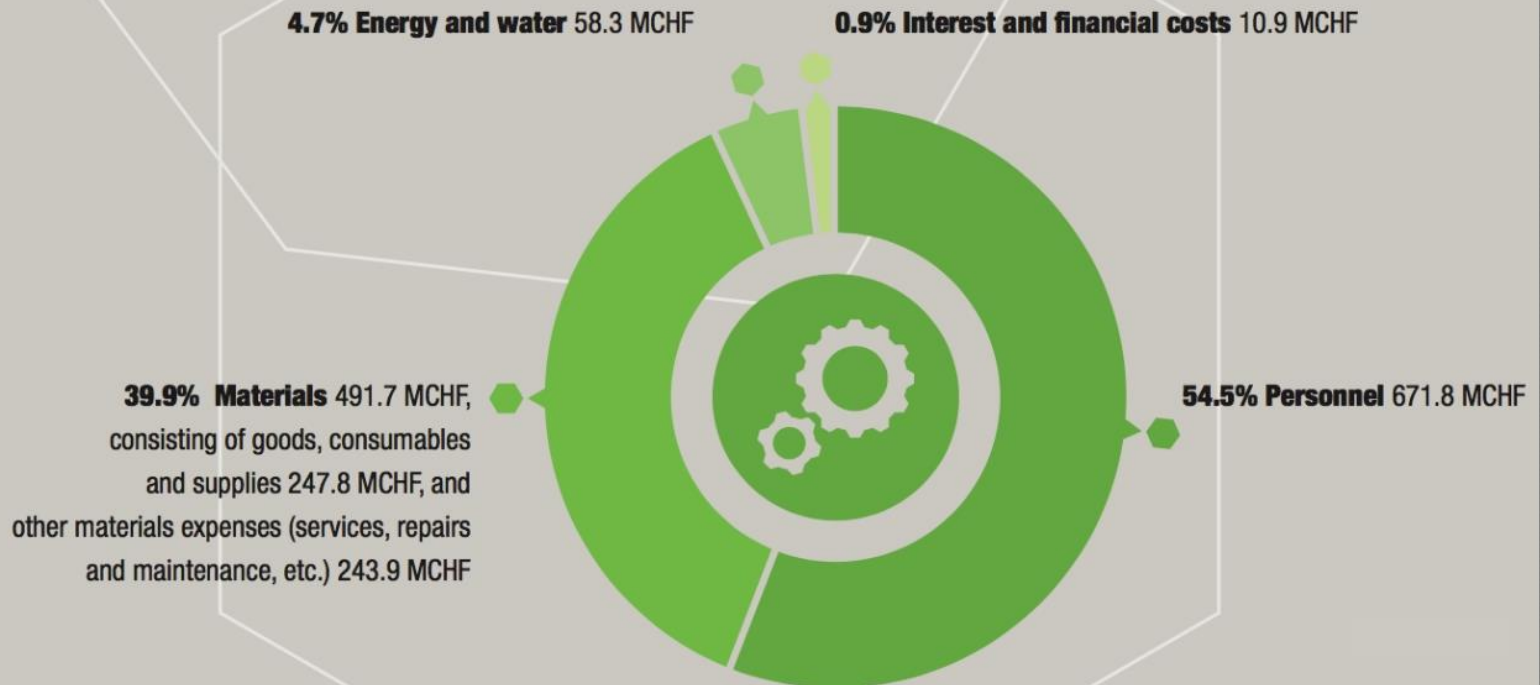
500 **estudantes**

11'000

2'000 companhias
«externas»

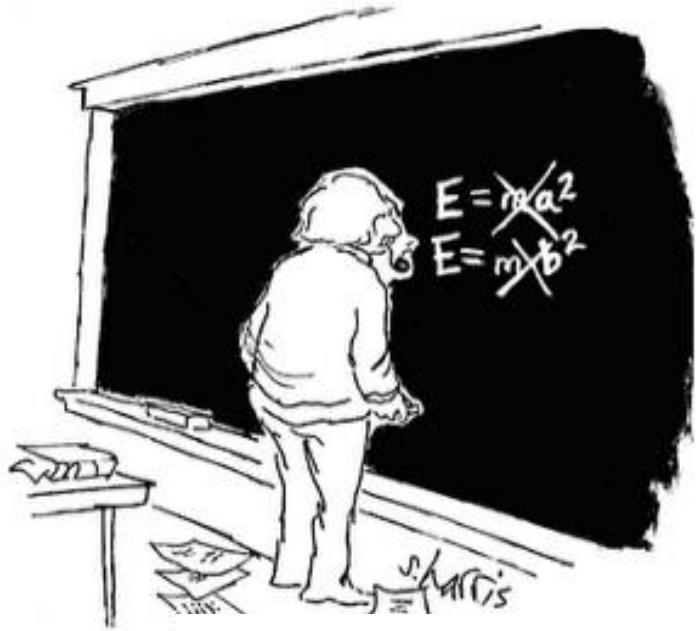
CERN EXPENSES

Total expenses 1232.7 MCHF



O CERN visto: pelos media:





$$r = r_0 \left[1 + \left(\frac{fr\omega}{c} \right) \cos(3\theta + \delta_0 + \delta_1 r) + \left(\frac{fr\omega}{c} \right)^2 \cos(5\theta + \delta_2 - \delta_3 r^2) + \left(\frac{fr\omega}{c} \right)^3 \cos(7\theta + \delta_4 - \delta_5 r^3) + \dots \right] \times \left\{ \frac{e^{3/5} r^2 \ln Z}{1 + \left(\frac{e}{r} \right)^{3/4}} \right\}$$

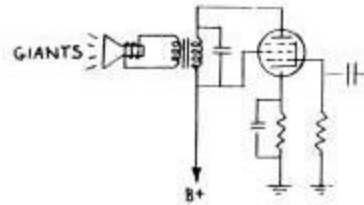
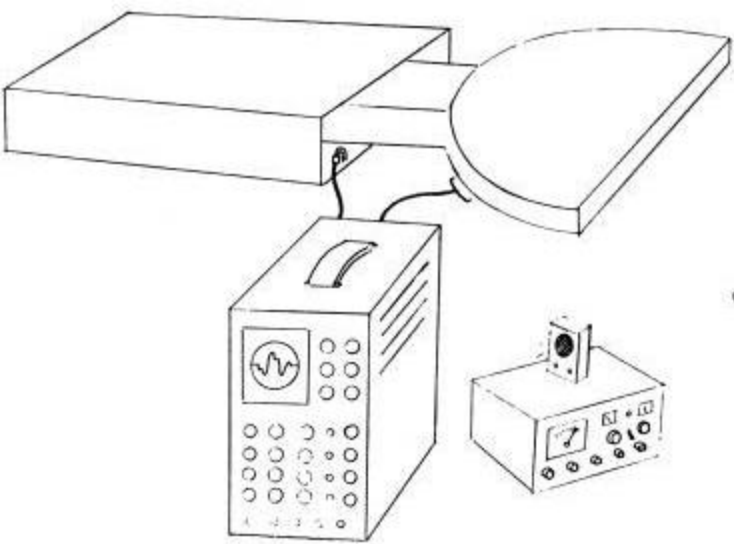
$$\frac{d\theta}{dt} = \left[\sin(\omega t - k\phi) - \sin k\phi - \frac{3}{5} f f_1 f_2 f_3' \right] \frac{eV_0}{2\pi\omega}$$

...físico teórico

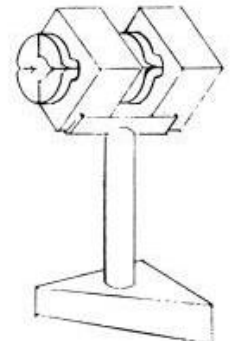
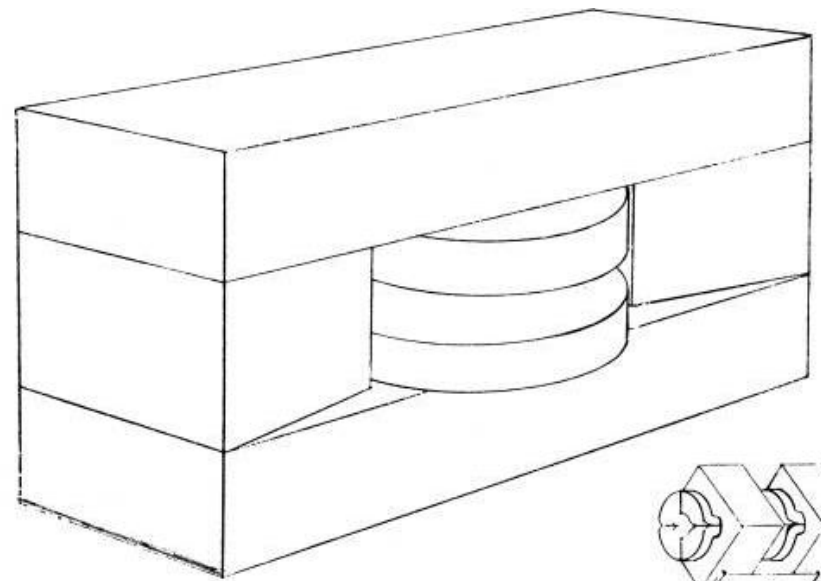


$p: 37.945067 \pm 0.0023 \text{ MeV}$
 $0.03 \times 0.05 \text{ cm.}$
 $\pm 0.000075 \text{ m rad.}$

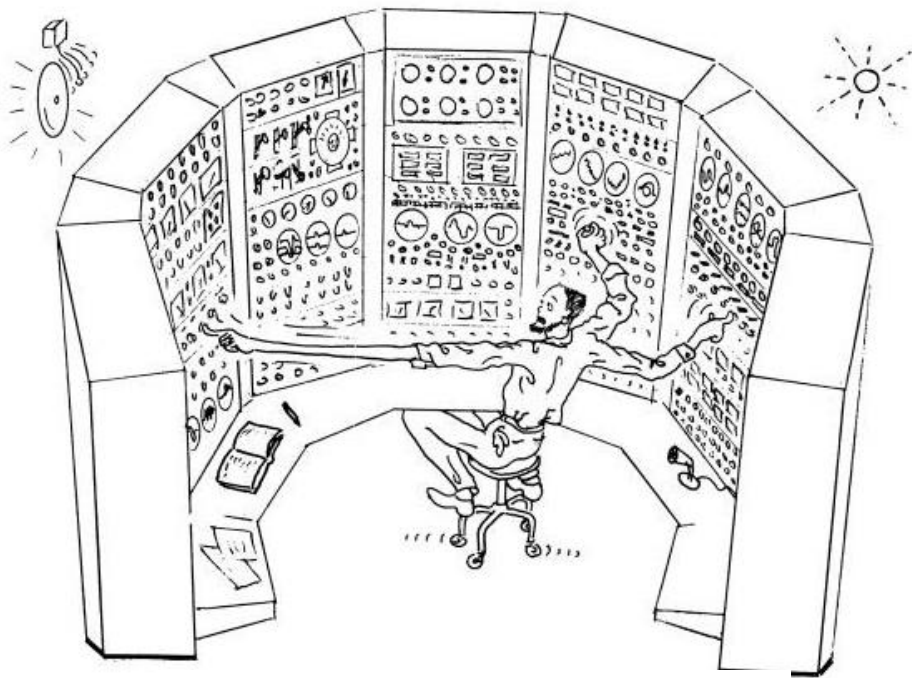
...físico experimental



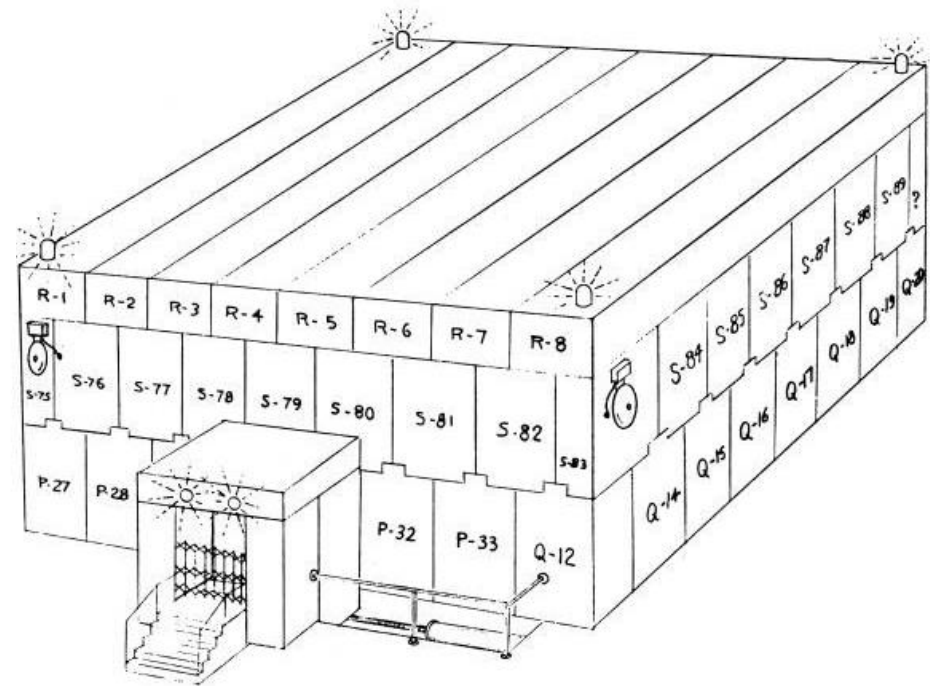
...Eng. Electrónica



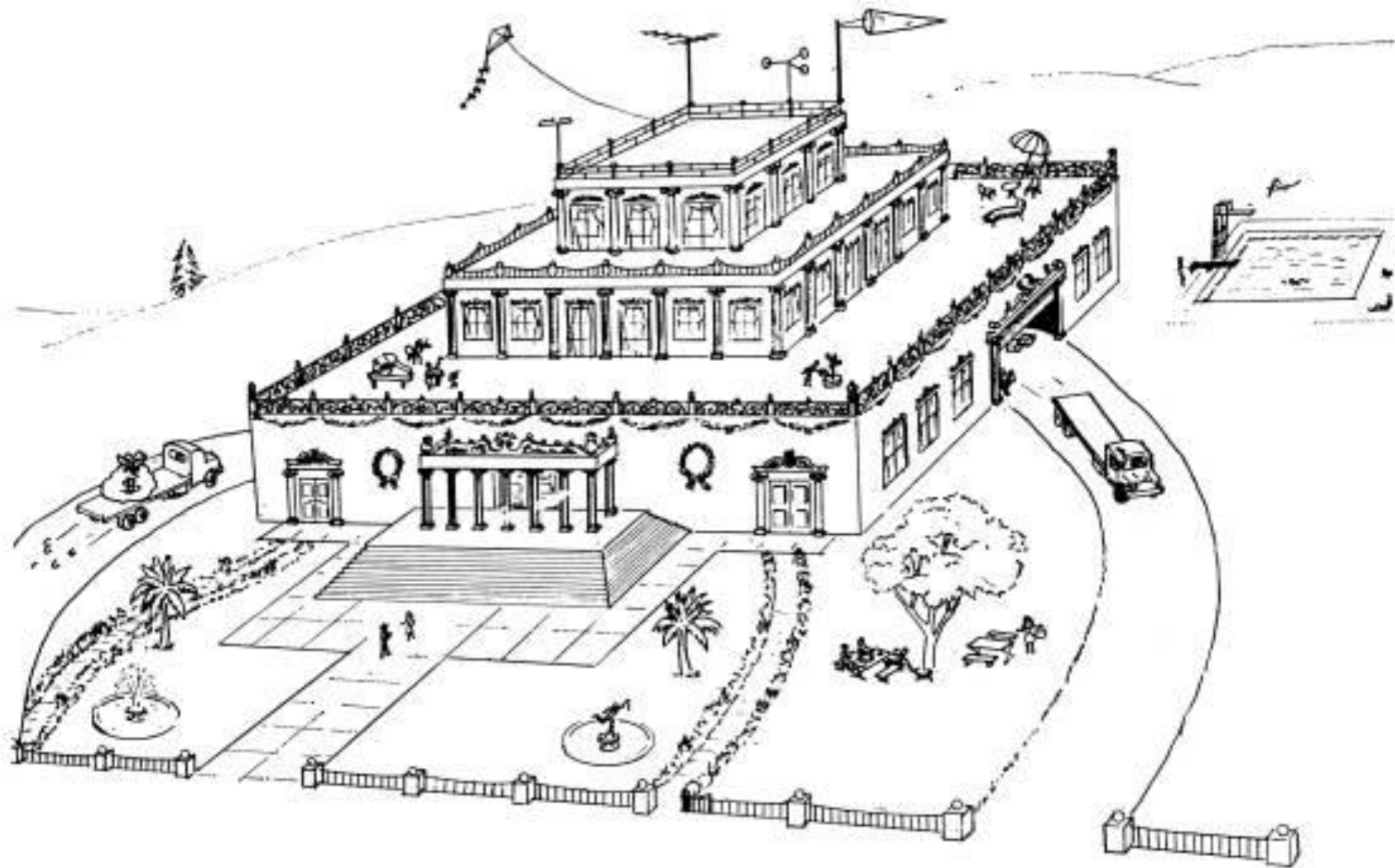
...Eng. mecânico



...operador

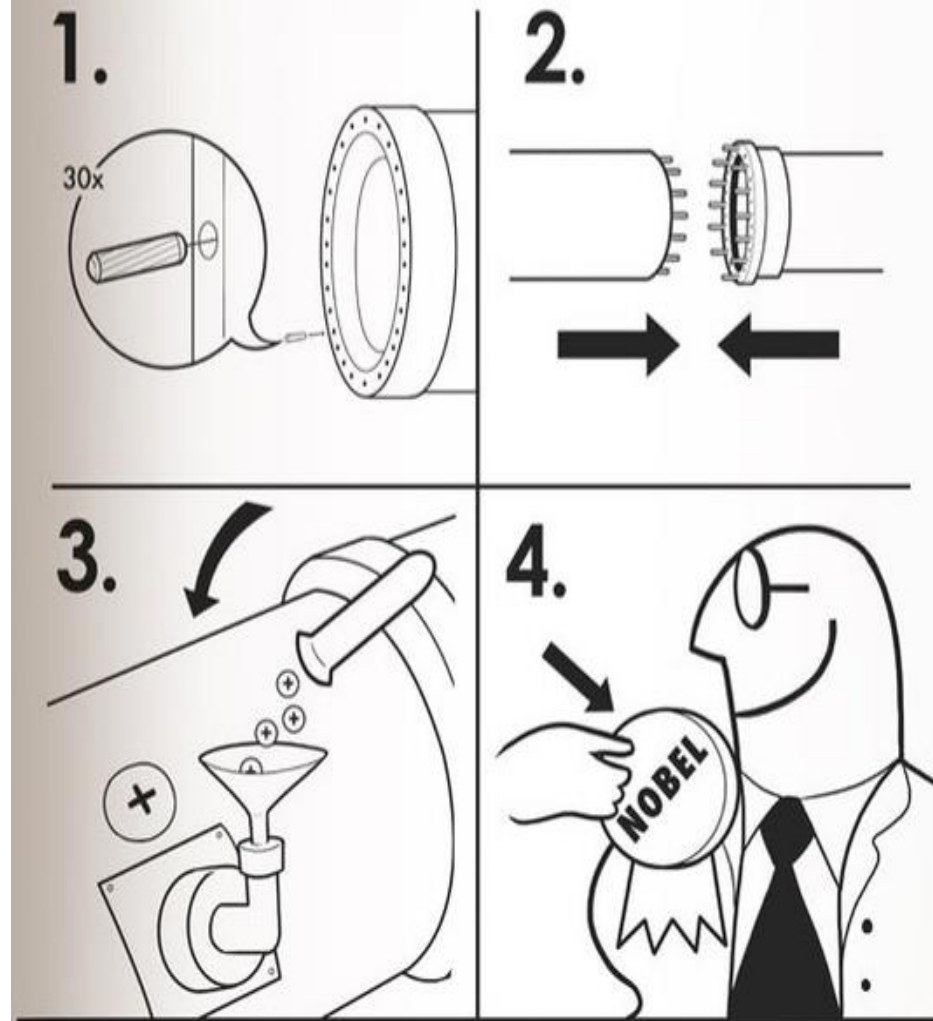
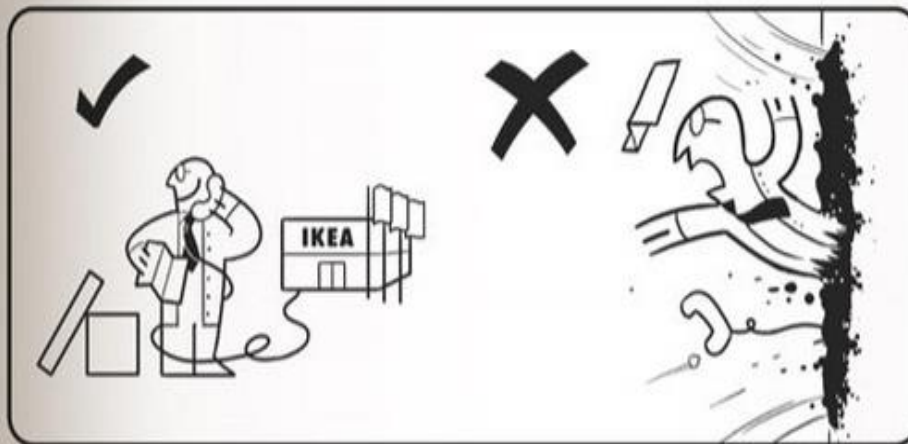
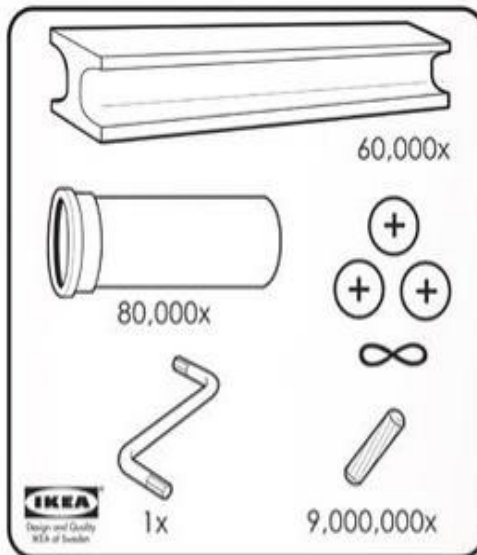
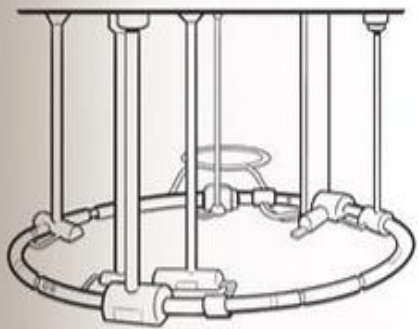


...rádio protecção

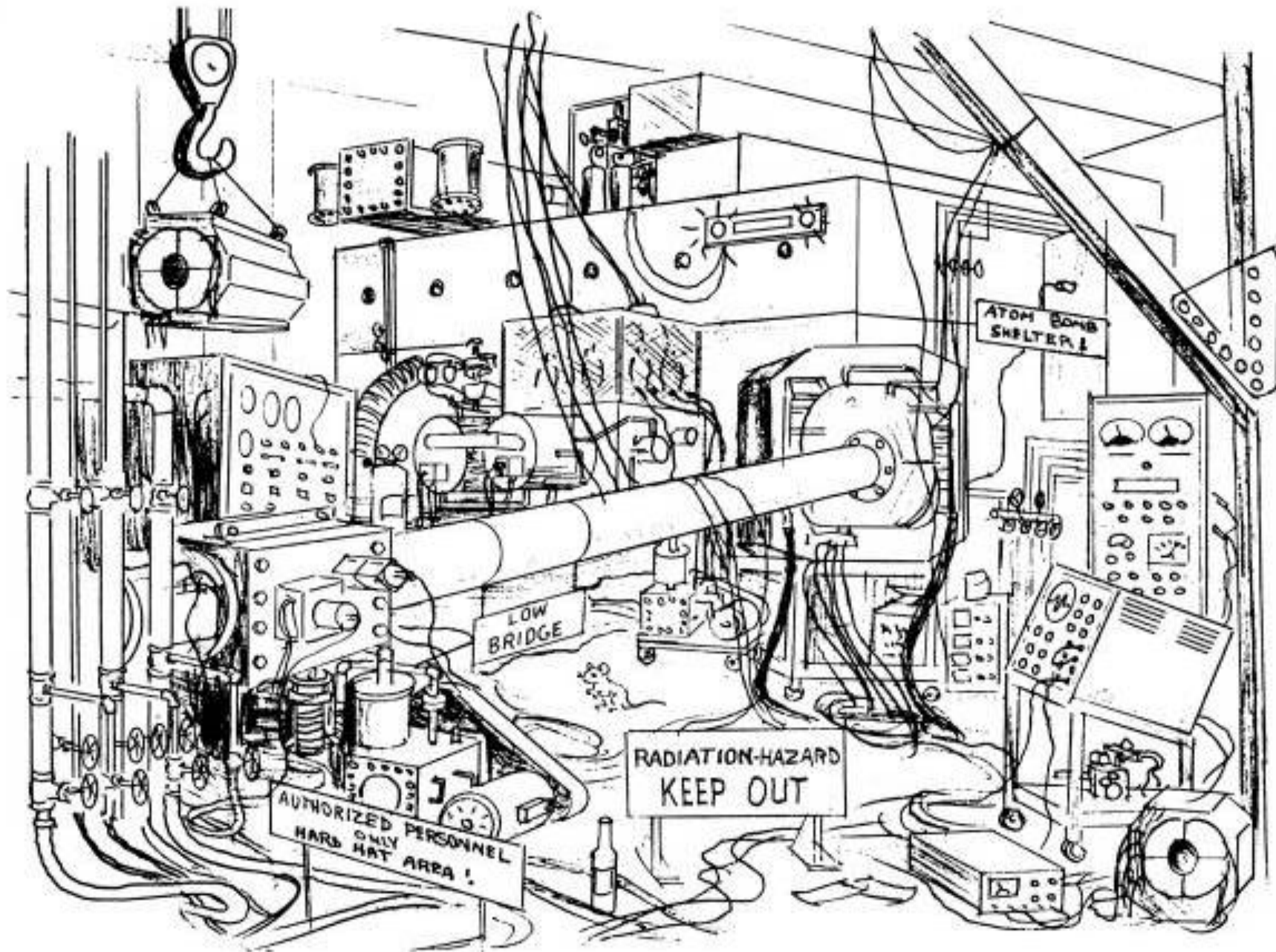


...agências de financiamento

HÄDRÖNN CJÖLIDDER

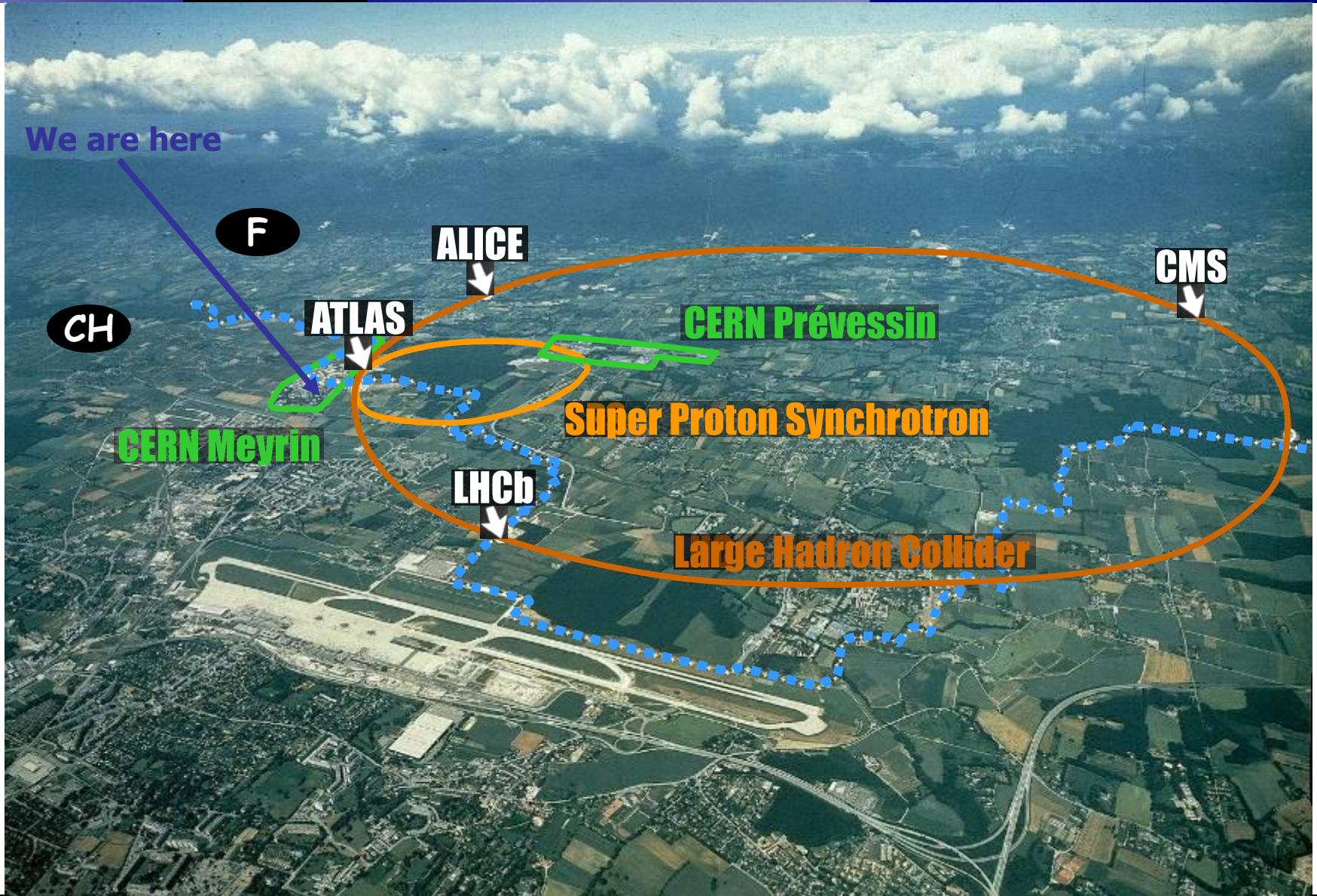


...método IKEA

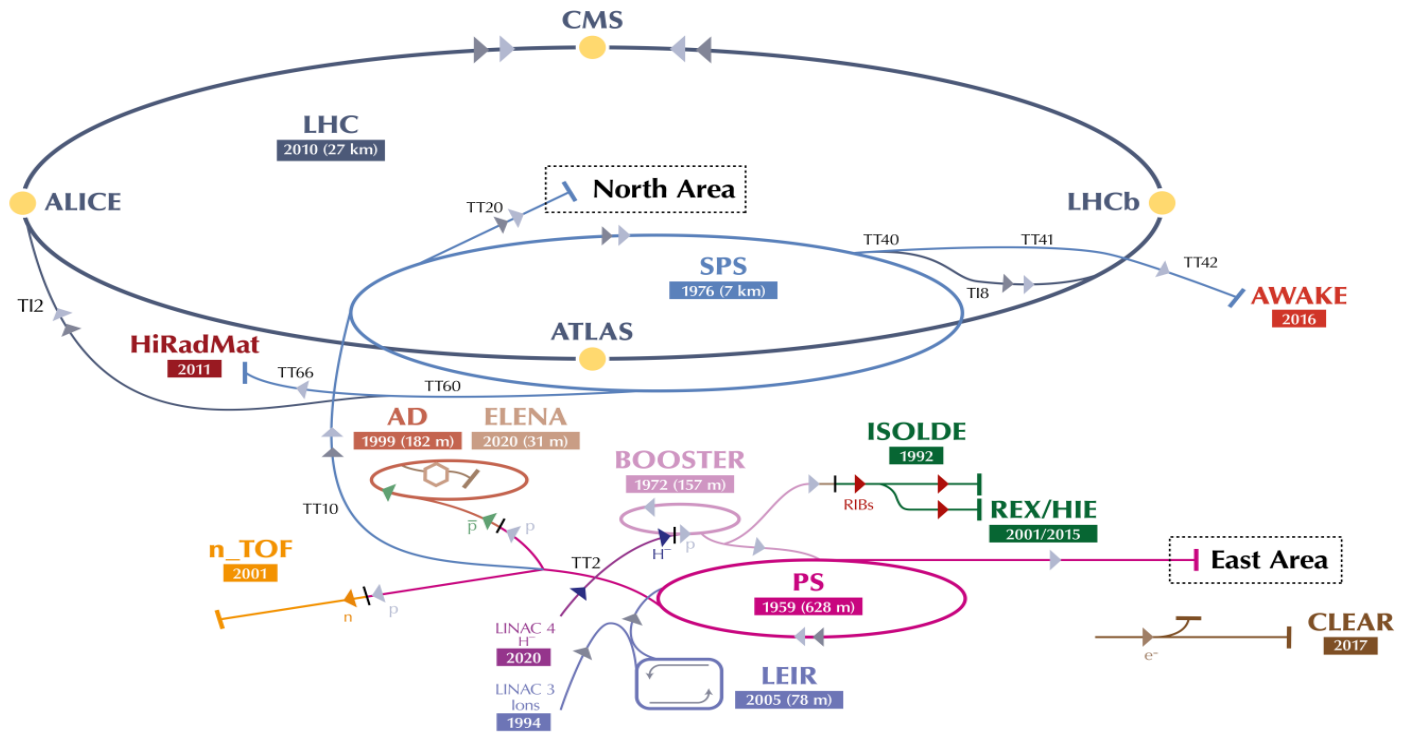


...por vocês!!





The CERN accelerator complex Complexe des accélérateurs du CERN



▶ H^- (hydrogen anions) ▶ p (protons) ▶ ions ▶ RIBs (Radioactive Ion Beams) ▶ n (neutrons) ▶ \bar{p} (antiprotons) ▶ e^- (electrons)

LHC - Large Hadron Collider // SPS - Super Proton Synchrotron // PS - Proton Synchrotron // AD - Antiproton Decelerator // CLEAR - CERN Linear Electron Accelerator for Research // AWAKE - Advanced WAKEfield Experiment // ISOLDE - Isotope Separator OnLine // REX/HIE - Radioactive Experiment/High Intensity and Energy ISOLDE // LEIR - Low Energy Ion Ring // LINAC - LINear ACcelerator // n_TOF - Neutrons Time Of Flight // HiRadMat - High-Radiation to Materials

Cadeia de aceleradores



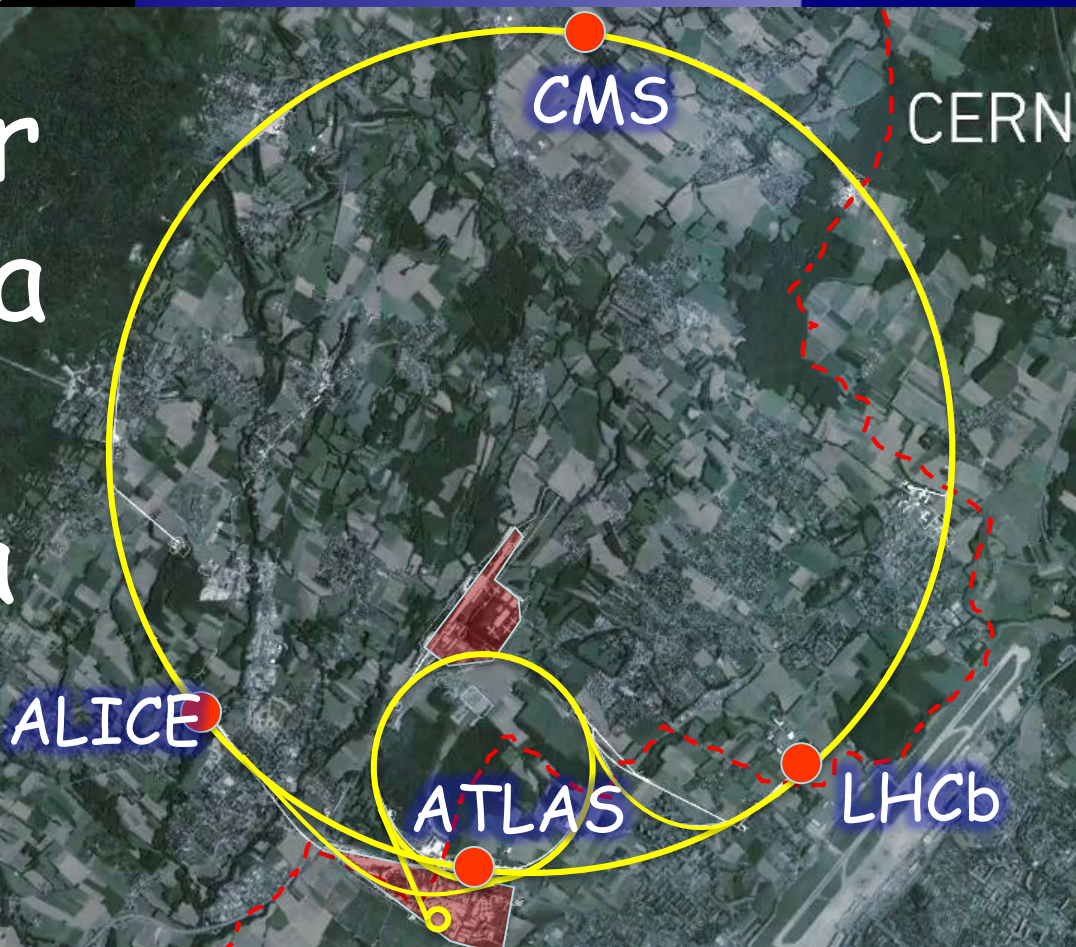
Milhões de colisões



A 3D perspective rendering of a particle collider tunnel. The tunnel is composed of several large, cylindrical sections with various internal structures. A bright yellow and white collision point is visible in the center, with a red laser line passing through it. The background is a dark blue gradient.

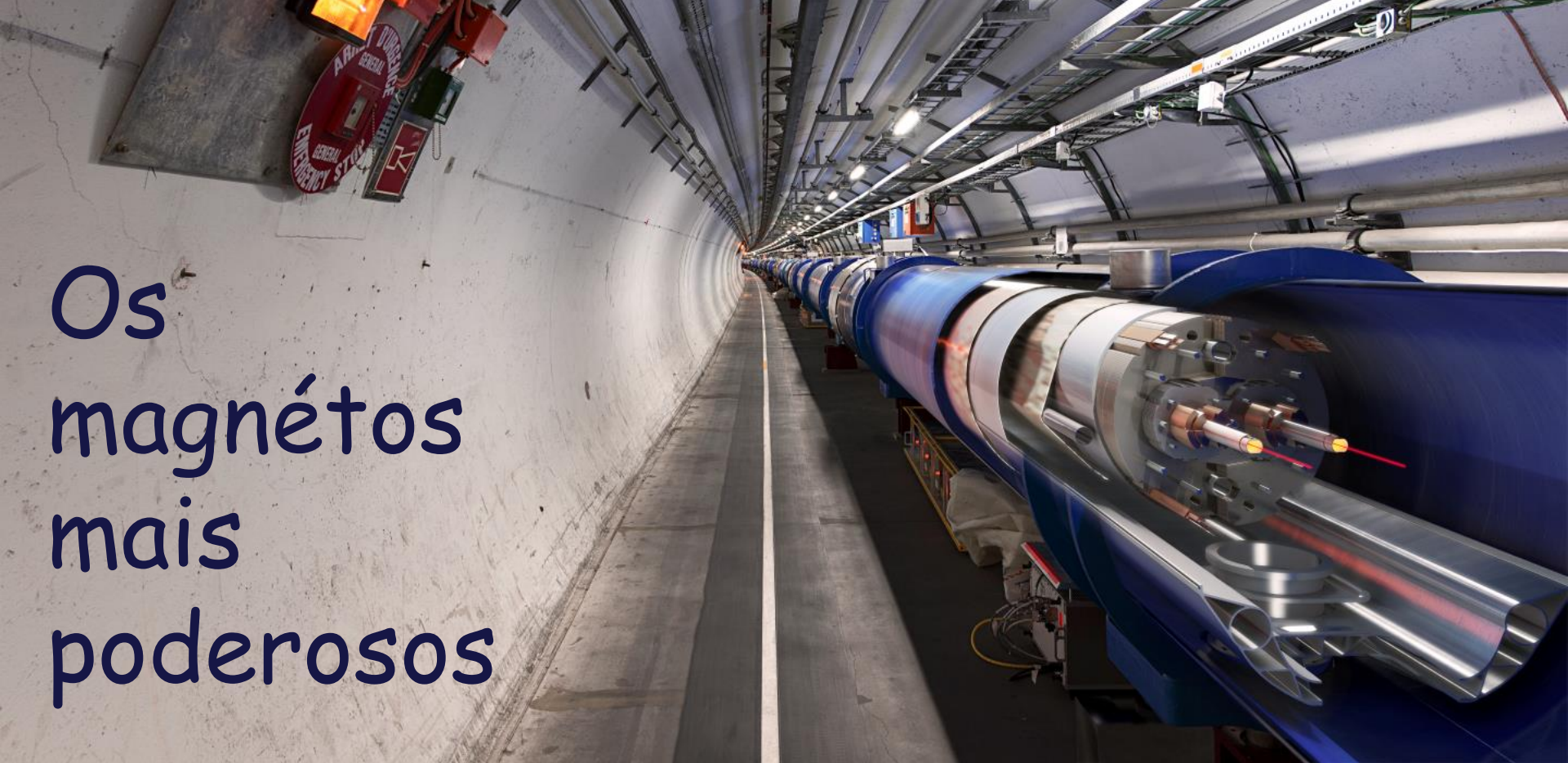
25 ns bunch crossing
25 ns entre les paquets

A maior maquina do planeta



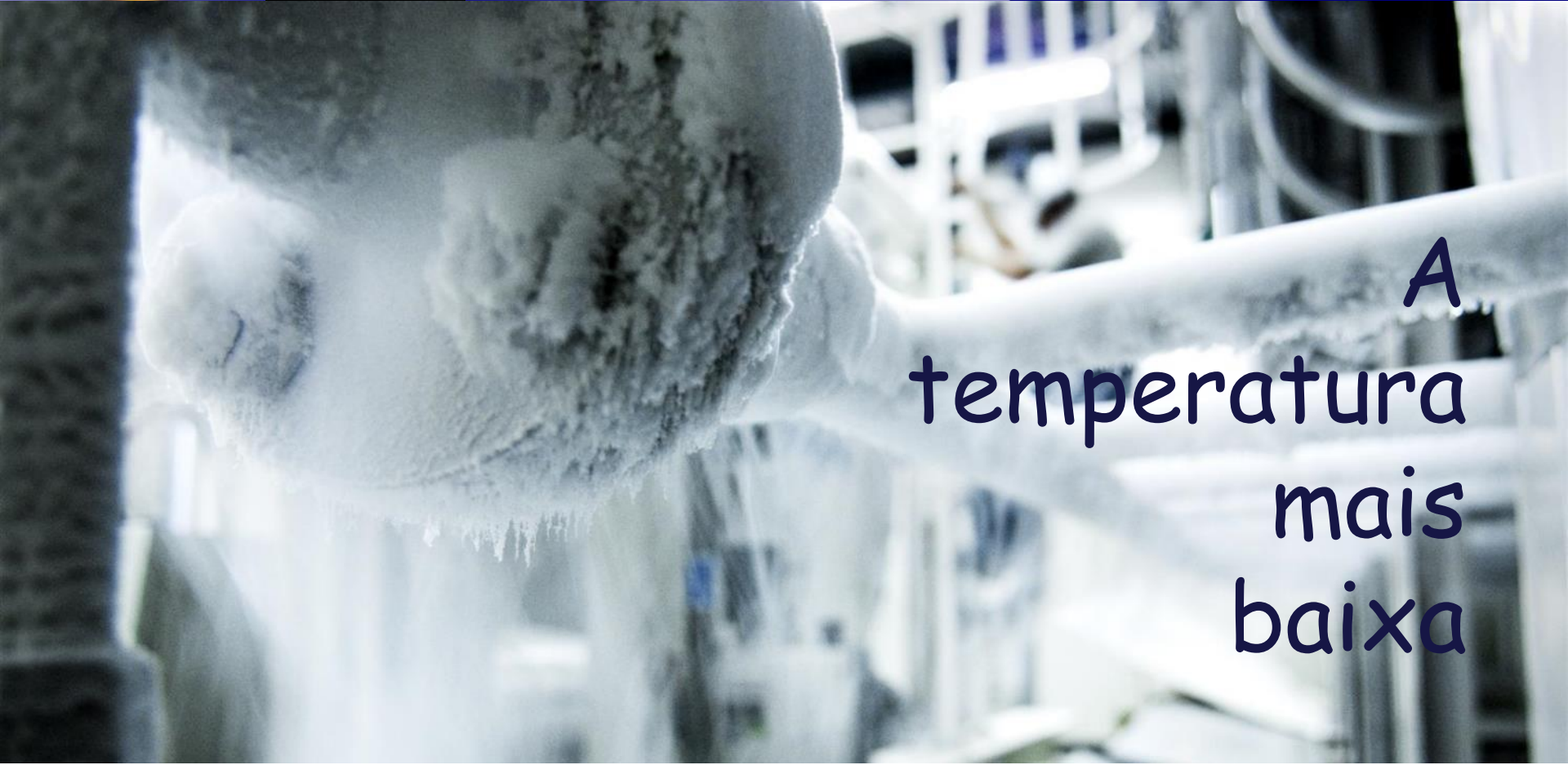
Os magnétos mais poderosos

~9000 magnetos
supercondutores





O Vazio mais « forte »



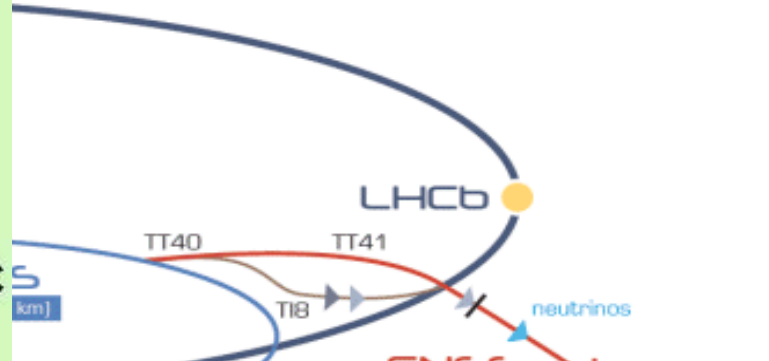
A
temperatura
mais
baixa

-271 Celsius (1.9K)

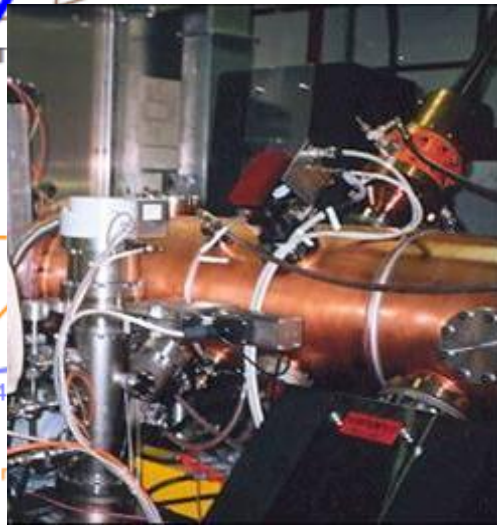


Os
melhores
professores
do mundo!!

Le complexe d'accélérateurs du CERN



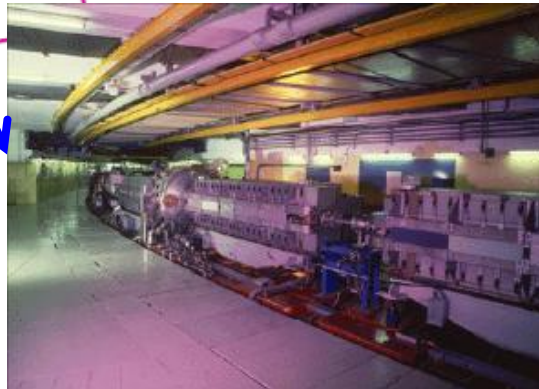
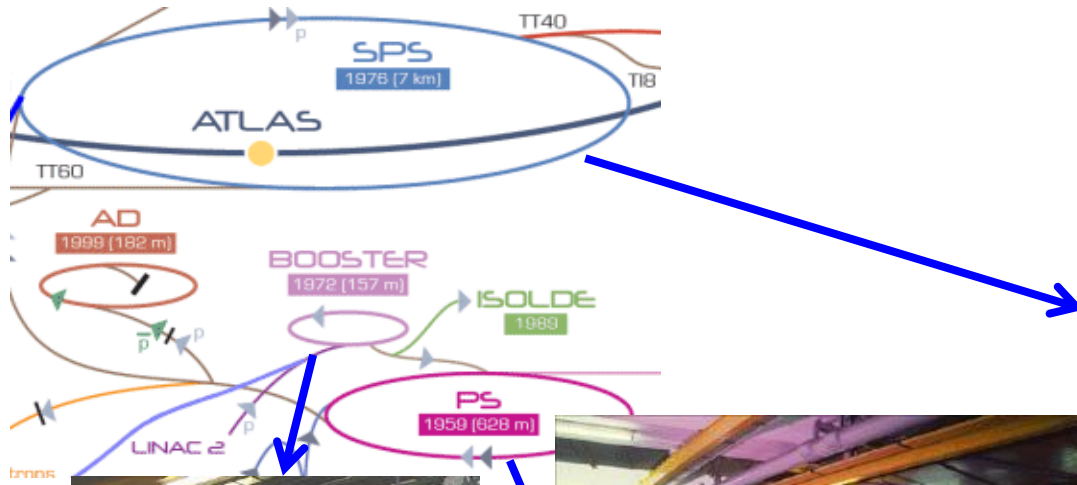
Fonte de Protões



RF quadripolo - 90 KeV



LINAC2 - 50 MeV



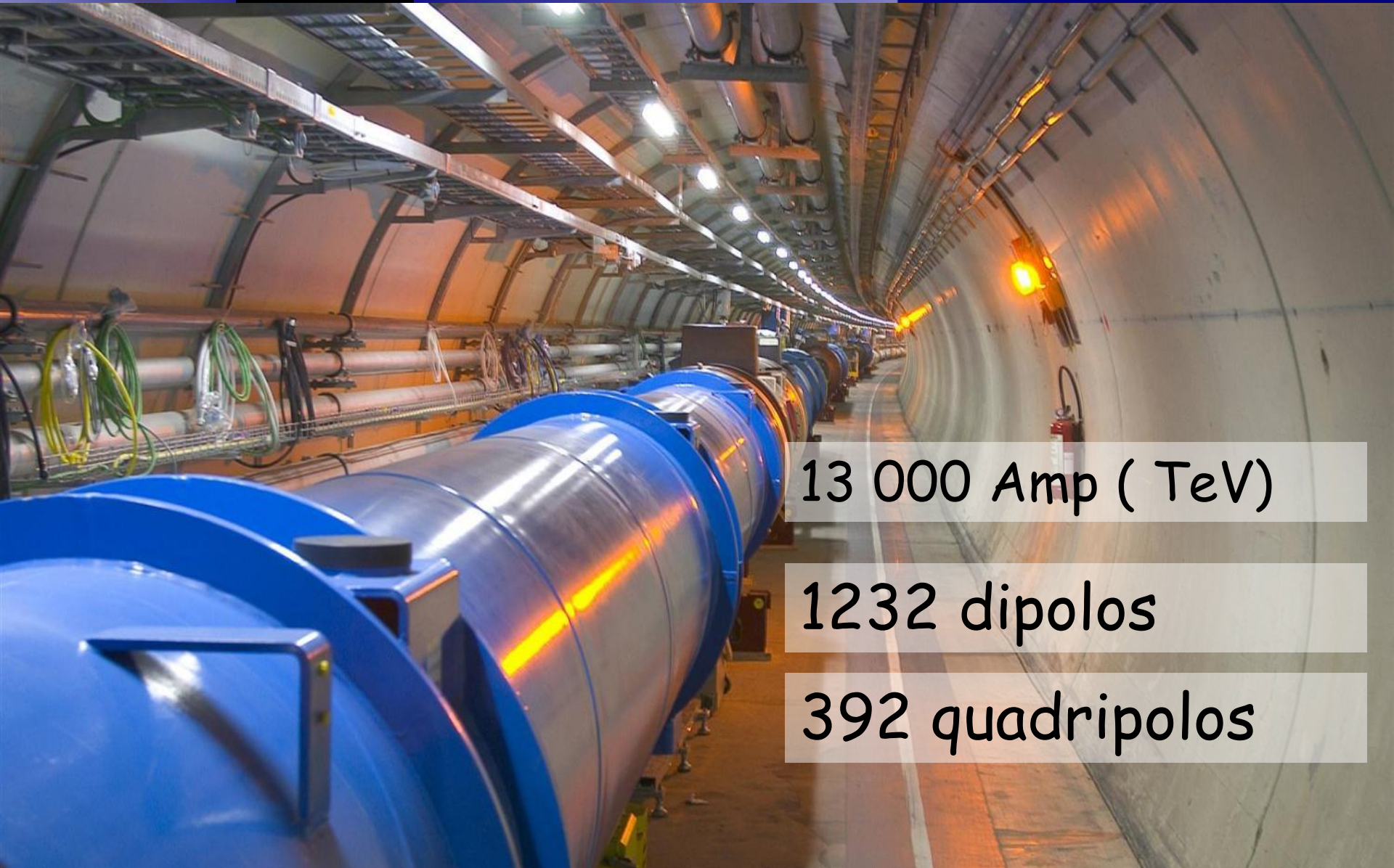
PS Booster 1.4 GeV

Proton Synchrotron 25 GeV

Super PS 450 GeV

Entre criar os grupos de prótons e leva-los a circular no SPS demora entre
5.86 seconds e 17.86 seconds

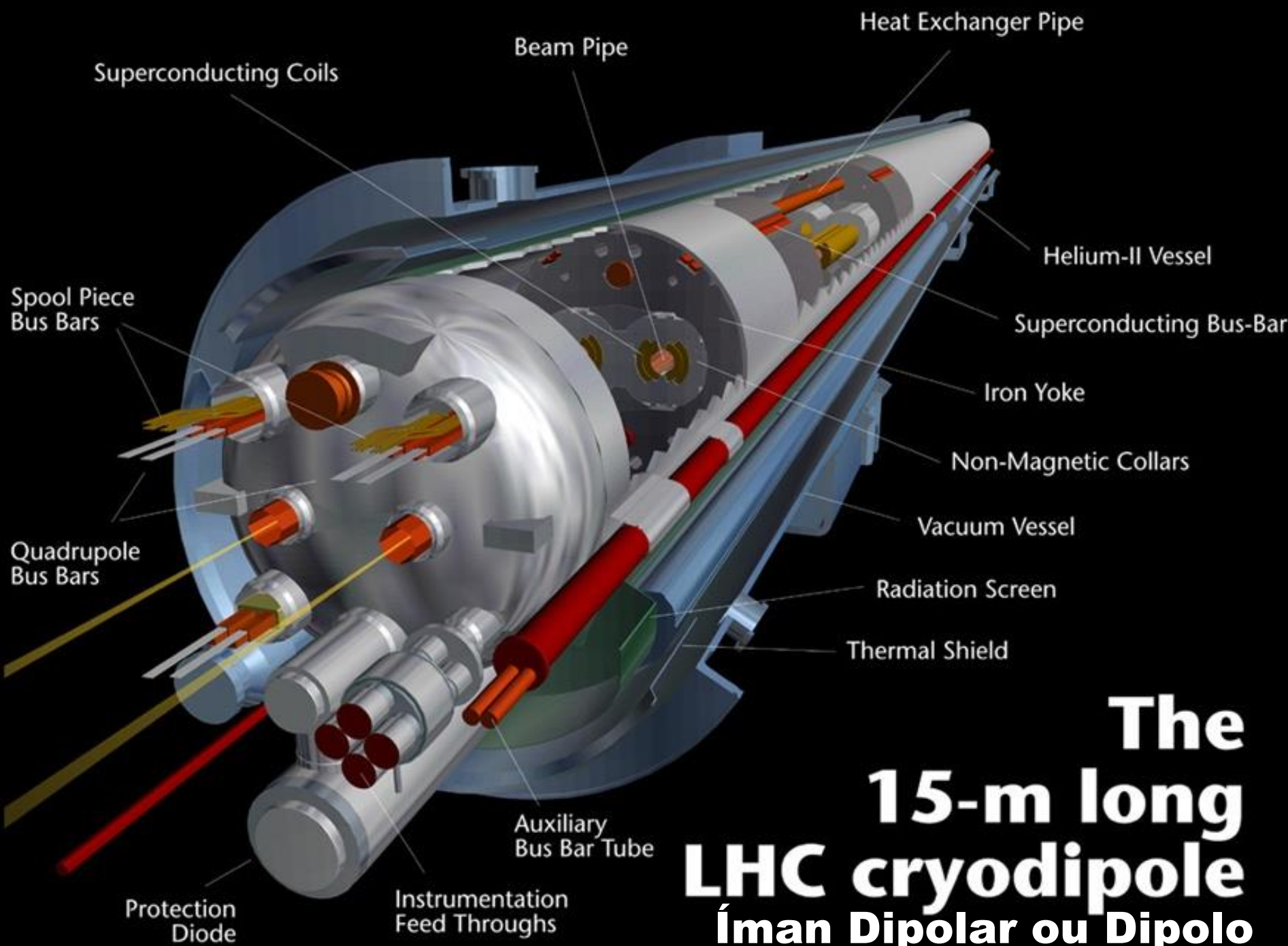
No SPS a energia dos prótons sobe ate 450GeV e demoram 4.3s a serem injectados no LHC



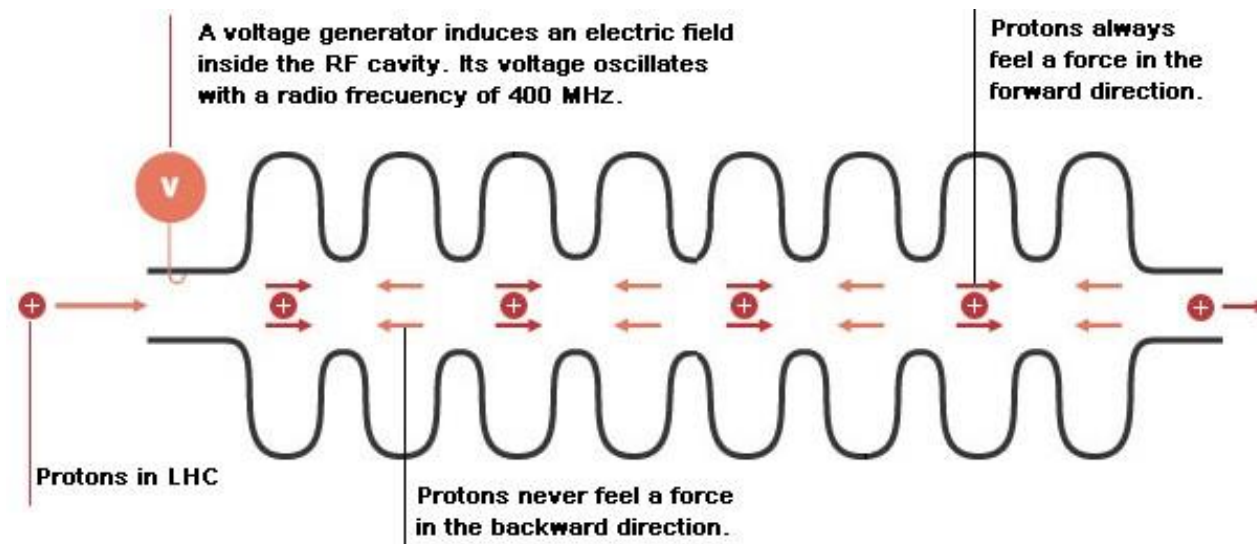
13 000 Amp (TeV)

1232 dipolos

392 quadripolos



The
15-m long
LHC cryodipole
Íman Dipolar ou Dipolo



Cada Protão que passa nas cavidades de radiofrequência fica sujeito a:

$$2 \times 8 \text{ MV} = 16 \text{ MV}$$

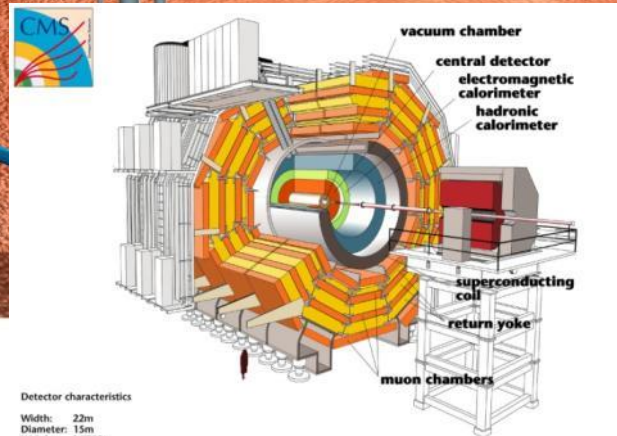
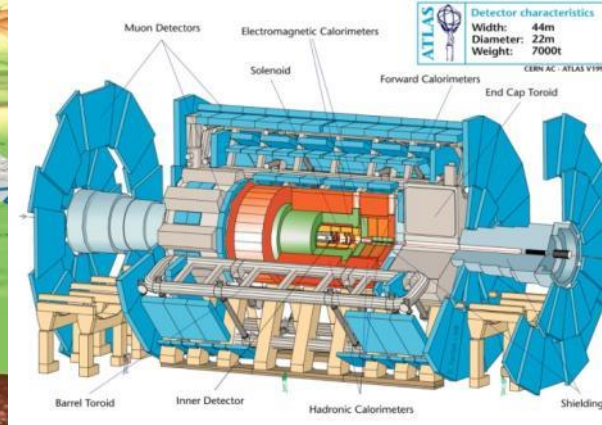
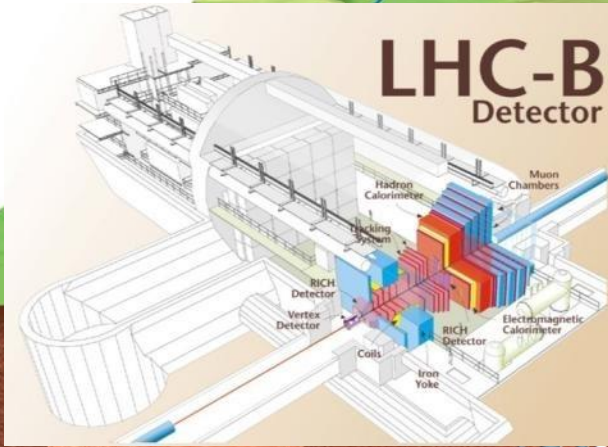
Recebe, portanto 16 MeV de energia extra

E como cada protao da 11245 voltas ao LHC pro segundo recebe :

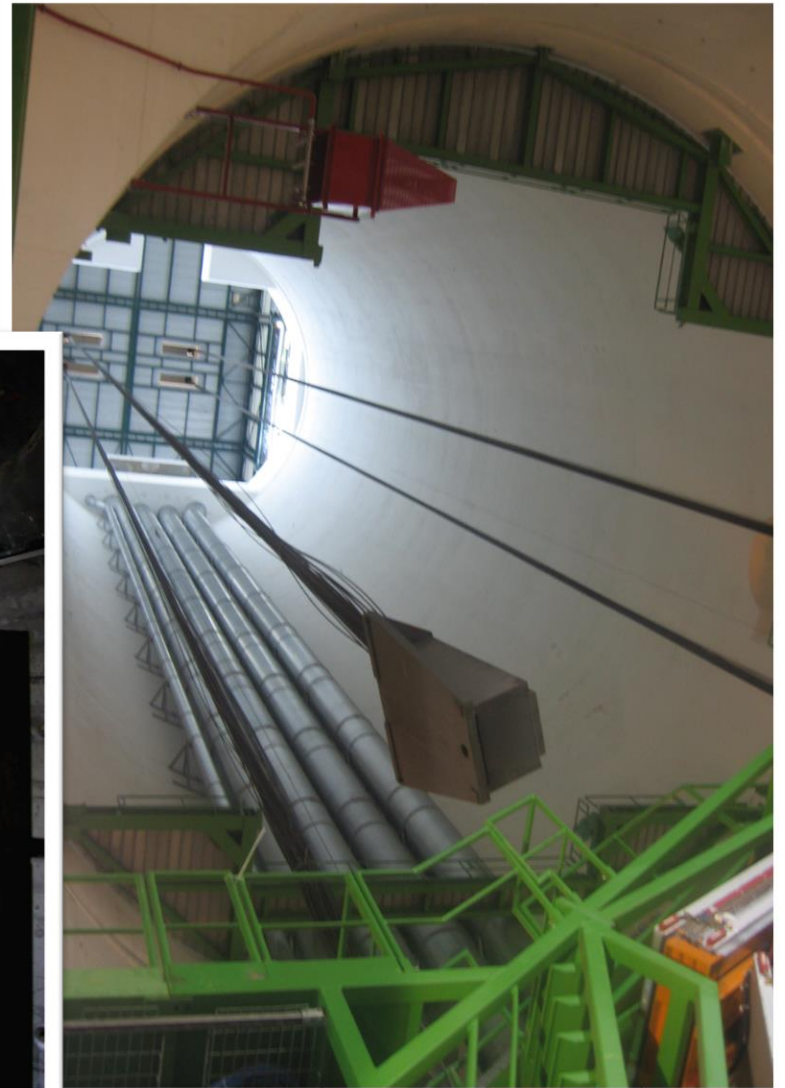
$$(16 \text{ MeV/lap}) \times (11245 \text{ laps/s}) = 1.8 \cdot 10^5 \text{ MeV/s or } 0.18 \text{ TeV/s}$$



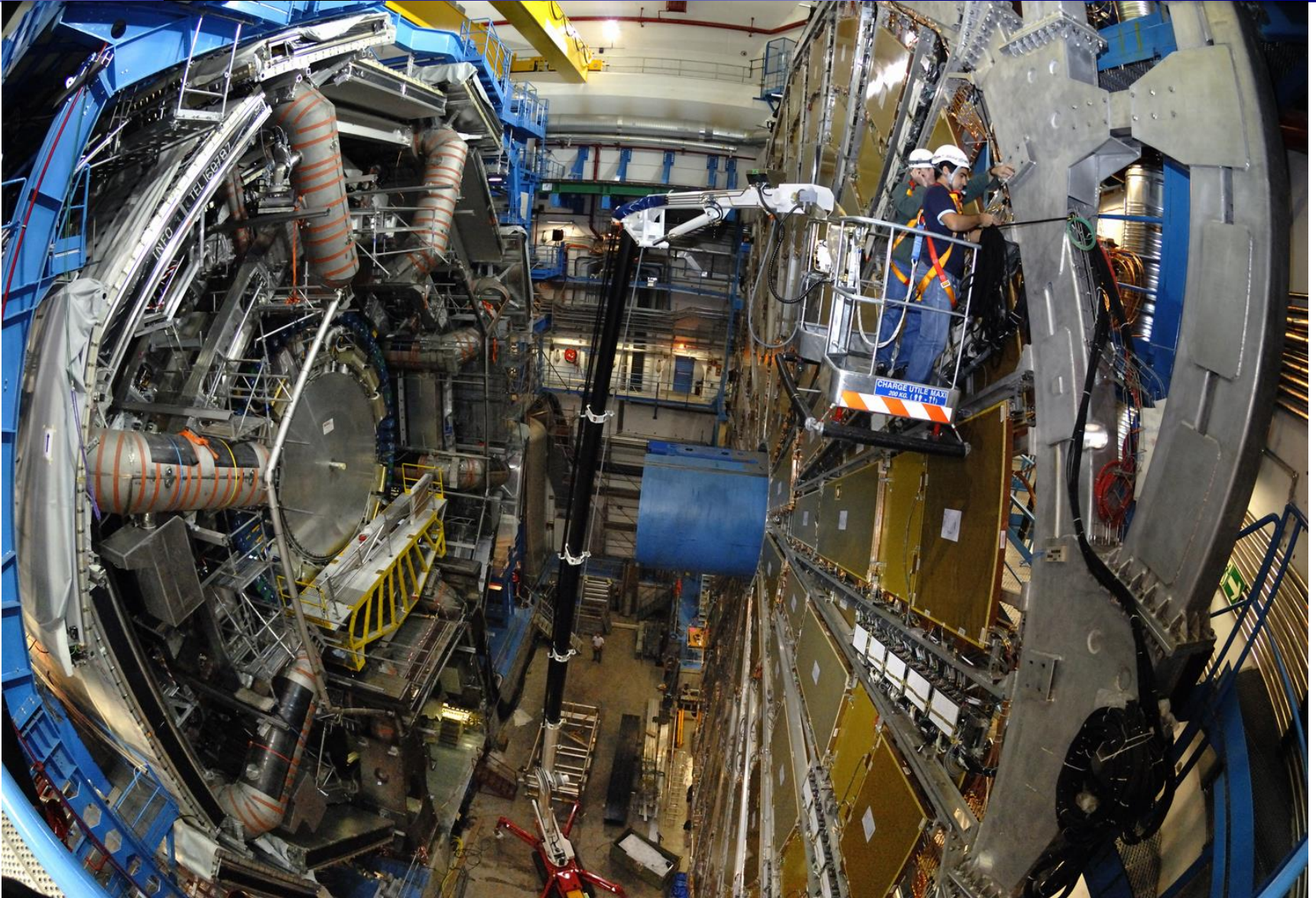
Cavidades RF LHC

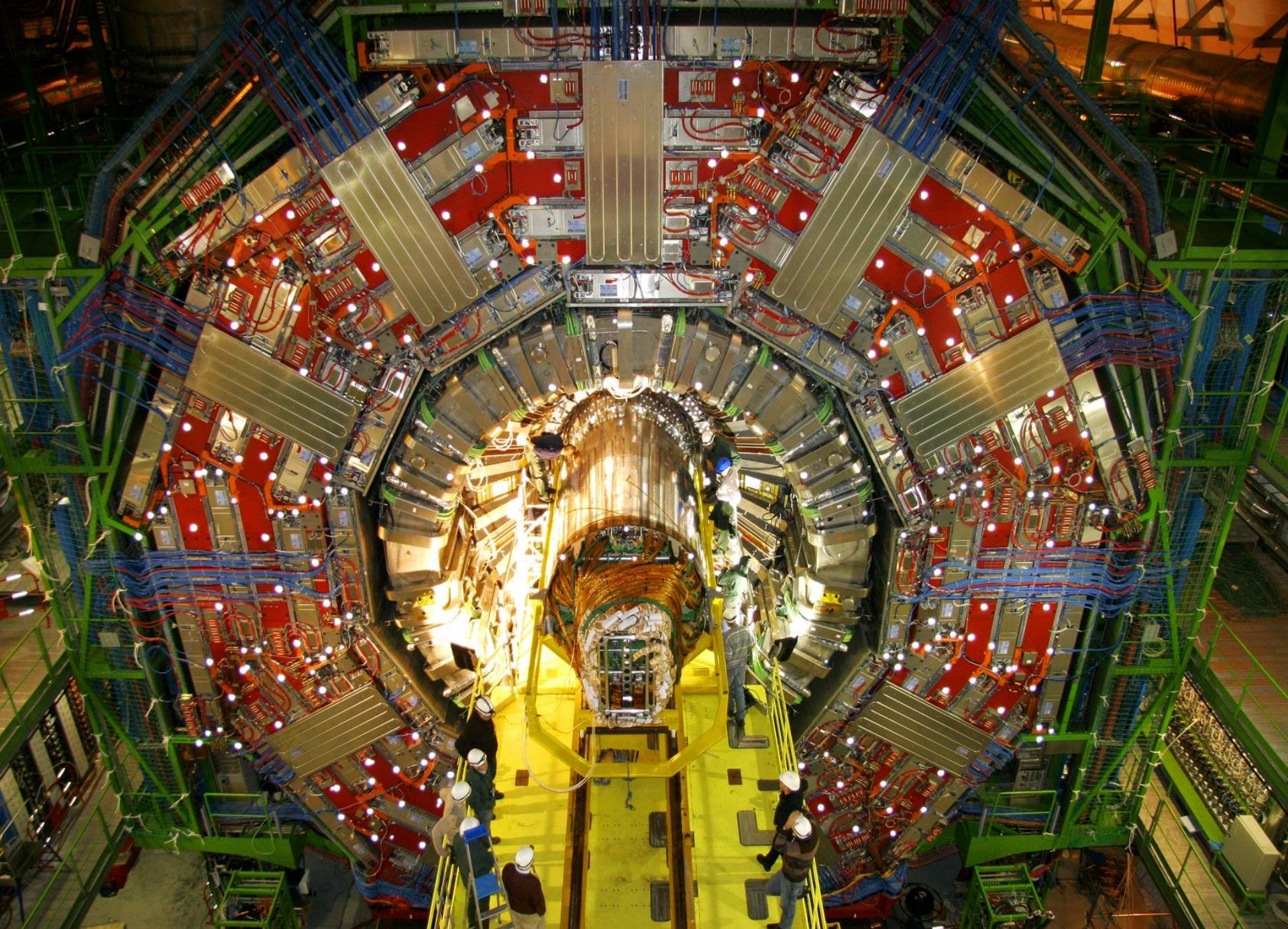


Detector characteristics
Width: 22m
Diameter: 15m
Weight: 14500t

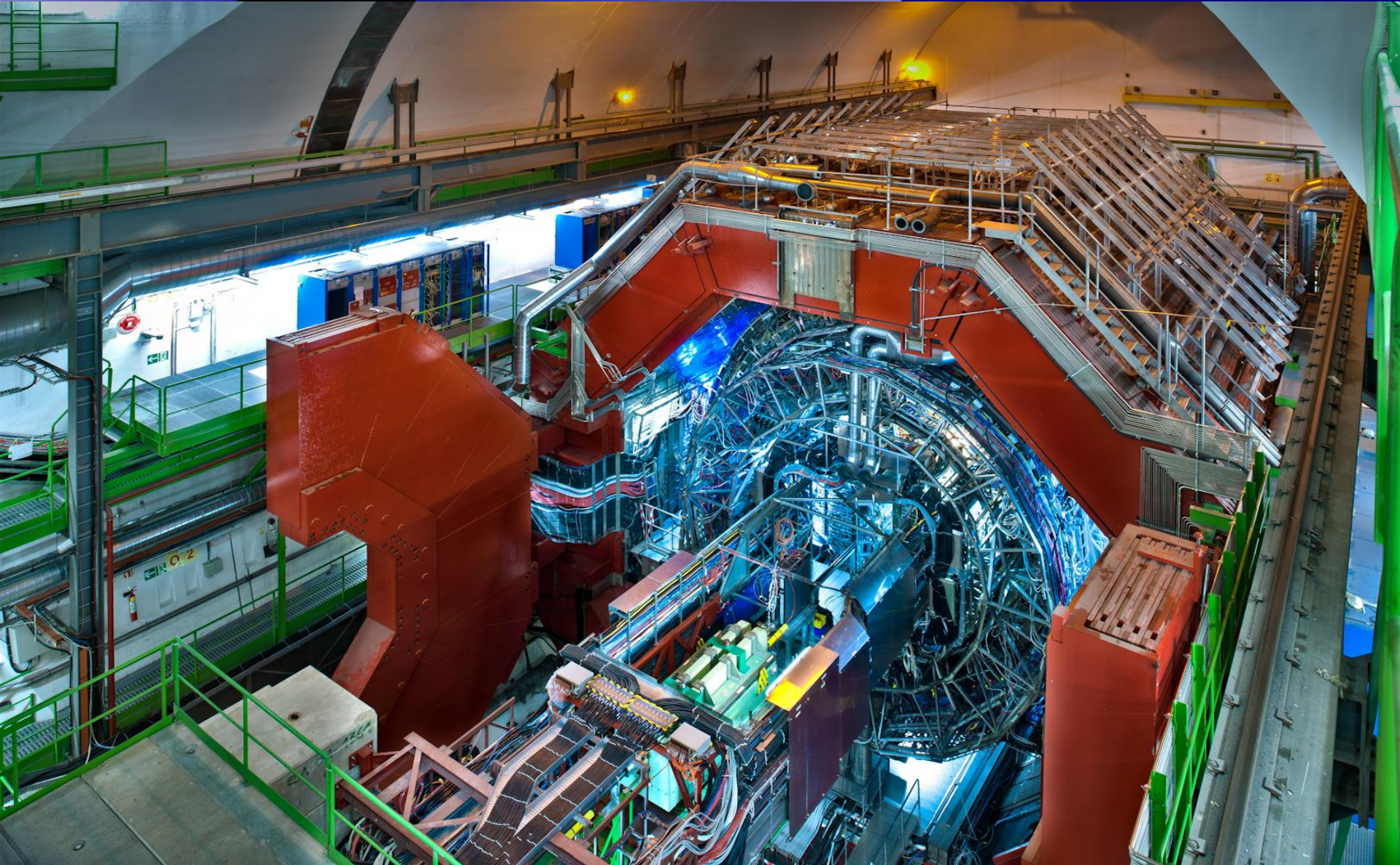


LHC Point 5 - UXC 55 Cavern - Point 6 headwall - 20-06-2003 - CERN ST/CE



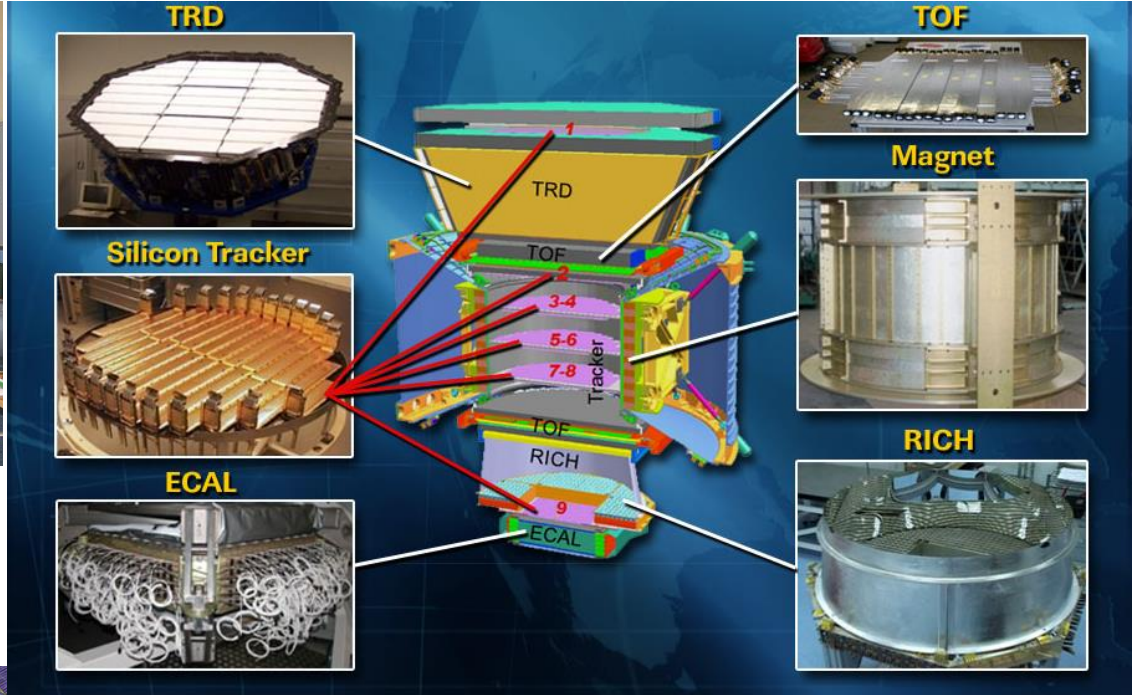








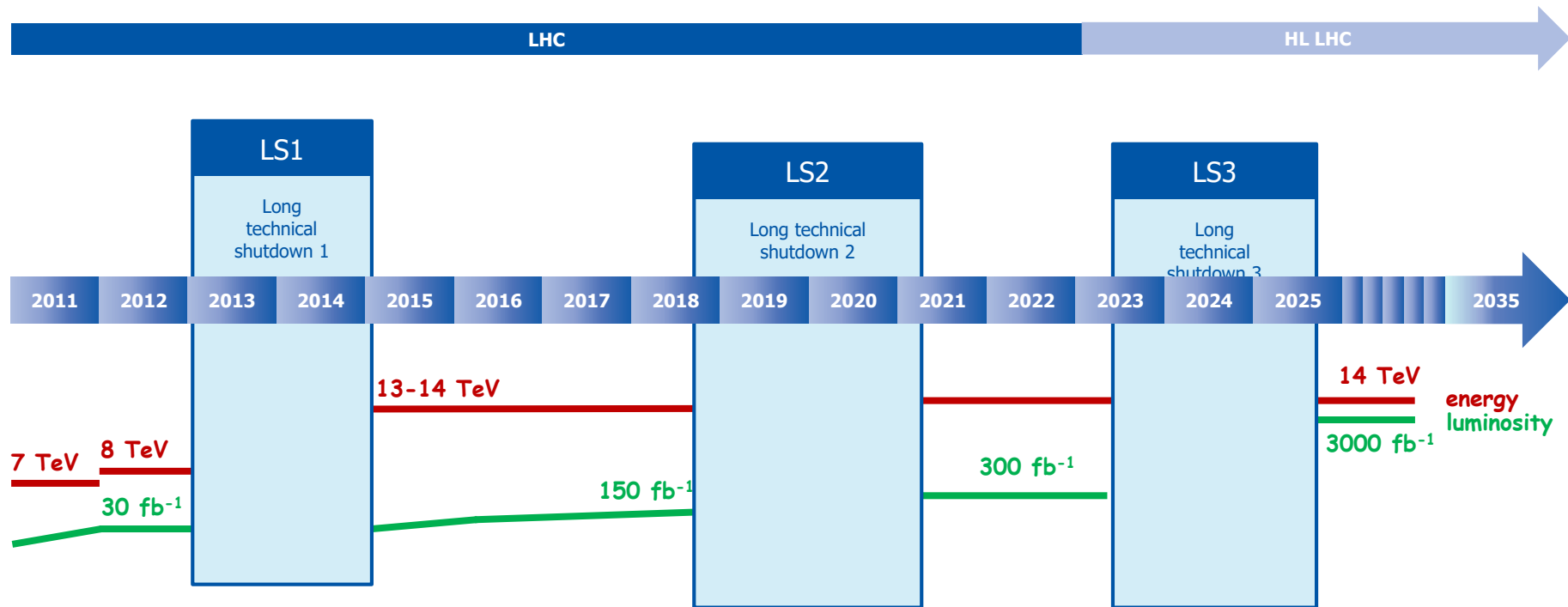
AMS Centro de Operações
@CERN Preveissin



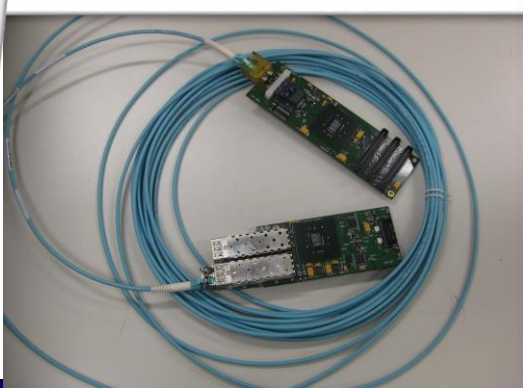
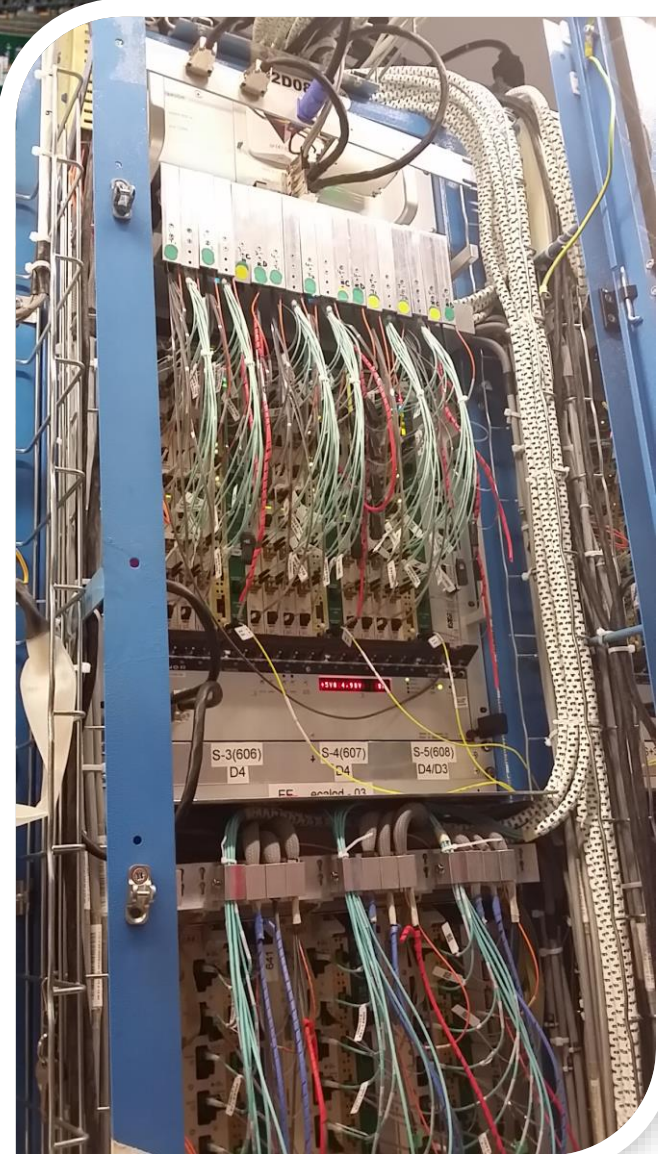
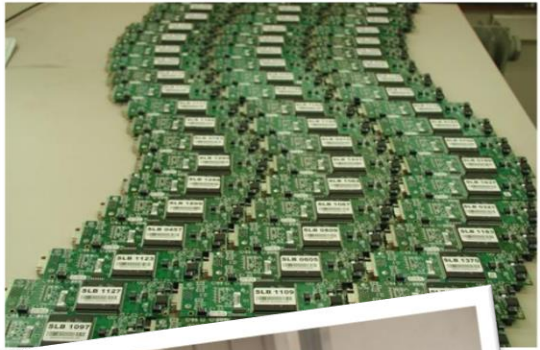
The GRID: a possible solution to CERN computing needs



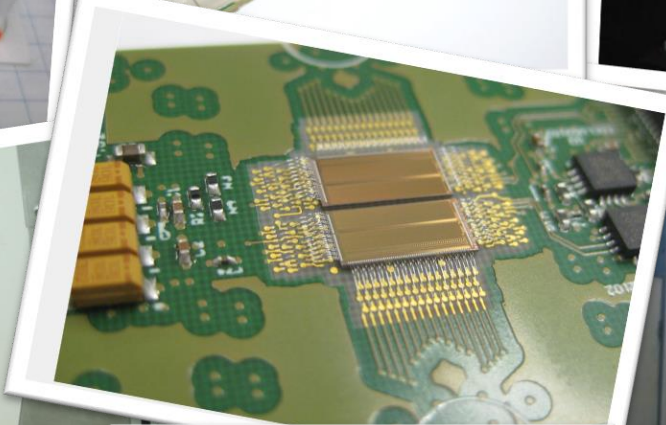
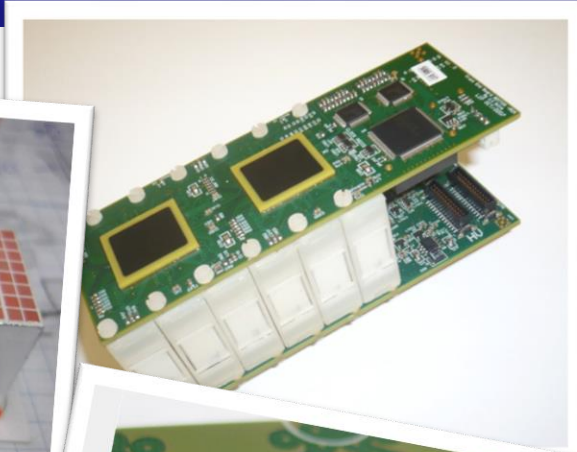
LHC (plano de utilização)

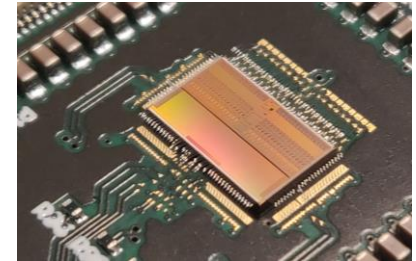
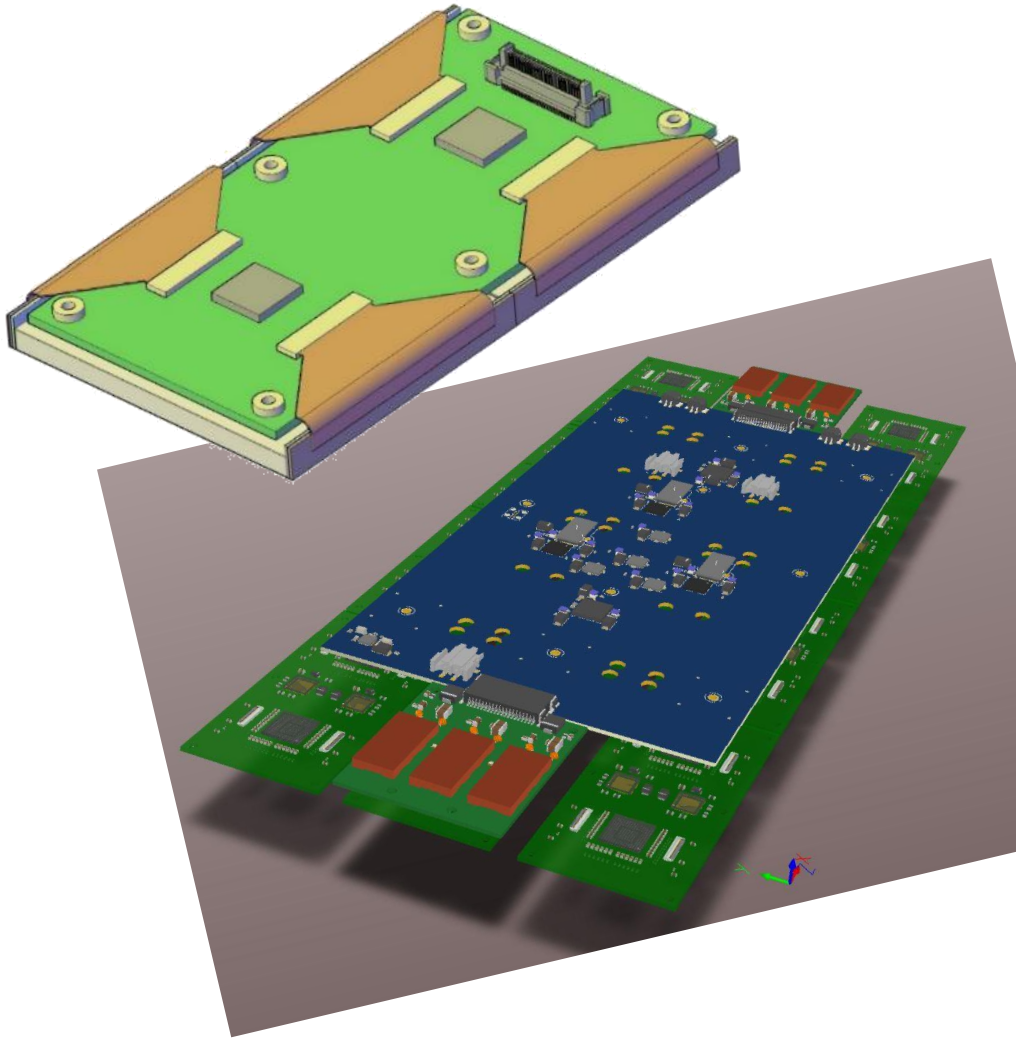


“home made” (CMS, PET, MT)



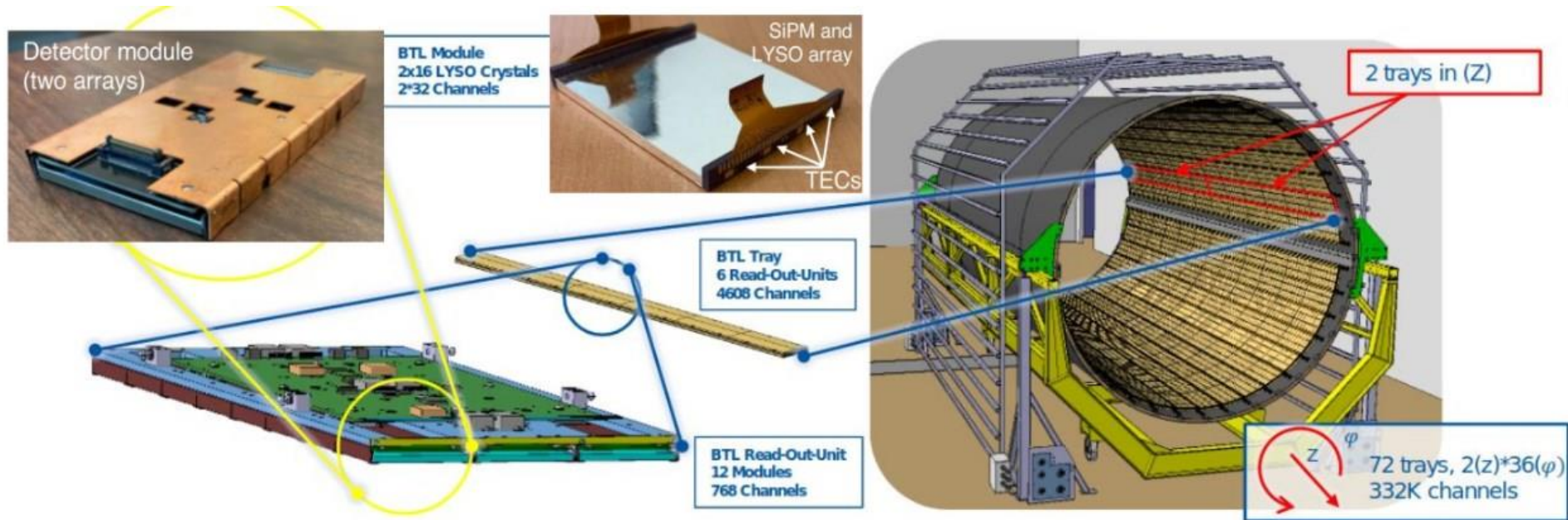
“home made” (CMS, PET, MT)





332K canais
5200 unidades
11400 Asic

BTL : Barrel Timing Layer -50ps de precisão











































332K canais
5200 unidades
11400 Asic

Weather Geneva

Canton of Geneva, Switzerland, 46.2°N 6.15°E, 400m asl

 **20 °C**

10:15 | 4 km/h

Sun Today	Mon Tomorrow	Tue 9-6	Wed 9-7	Thu 9-8	Fri 9-9	Sat 9-10
						
26 °C	28 °C	26 °C	24 °C	22 °C	20 °C	20 °C
14 °C	16 °C	17 °C	16 °C	16 °C	13 °C	12 °C
 8 km/h	 11 km/h	 10 km/h	 9 km/h	 14 km/h	 18 km/h	 9 km/h
 -	-	 10-20 mm	 10-20 mm	 10-20 mm	 0-10 mm	-
 11 h	 9 h	 6 h	 1 h	 5 h	 5 h	 0 h
 	 	 	 	 	 	 

Important Numbers

EMERGENCY: Fire brigade
+41 22 76 74444 (internal: 74444)

NON EMERGENCY: CERN medical service
+41 22 76 73802 (internal: 73802)

Ze Carlos : +41754112406
(internal : 162406)
Pedro : +41754119170
(internal : 169170)





Para todas as visitas :



WiFi

((CERN))



LANDB: Portal

Home > Registration > Visitor

English Français

1 Personal Details Modify

Name	First Name Last Name
Company / Institute	School Name
Phone	+32 345678930
Email	firstname.lastname@email.com
Hardware Address	EC-39-86-31-1B-0E

2 Visit Details

Arrival Date	Departure Date
Arrival Date: 4.9.20	Departure Date: 10.9.22

This is a required field. This is a required field.

The arrival date is the date you arrive at CERN. If approved, the registration of your device will be void from this date during 2, 3 or 4 weeks. After this, the... Read more

Reason

Reason: Portuguese Teachers Program

This will allow your CERN contact person to distinguish your various visits. Please be as clear as possible.

Contact Person

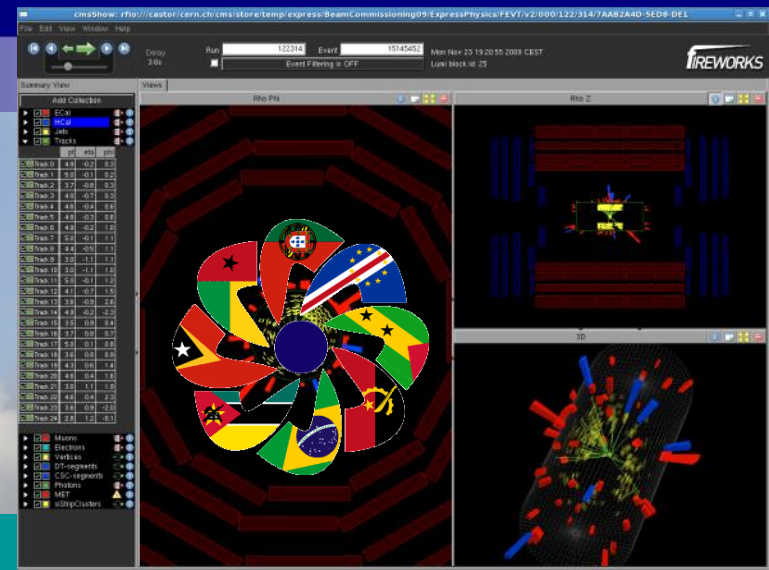
Contact Person: Pedro.Abreu@cern.ch

The contact person should be a CERN staff, fellow or contract personnel member, so that he/she can approve your request. You MUST know the contact person.

I confirm that I know the contact person. This person will be contacted by email to confirm your request.

Previous Next

3 Confirmation



*Obrigado e
Uma Boa
Escola!*

**Colaboração
Internacional**

**Pesquisa
Física
Fundamental**

Formação

Tecnologia

