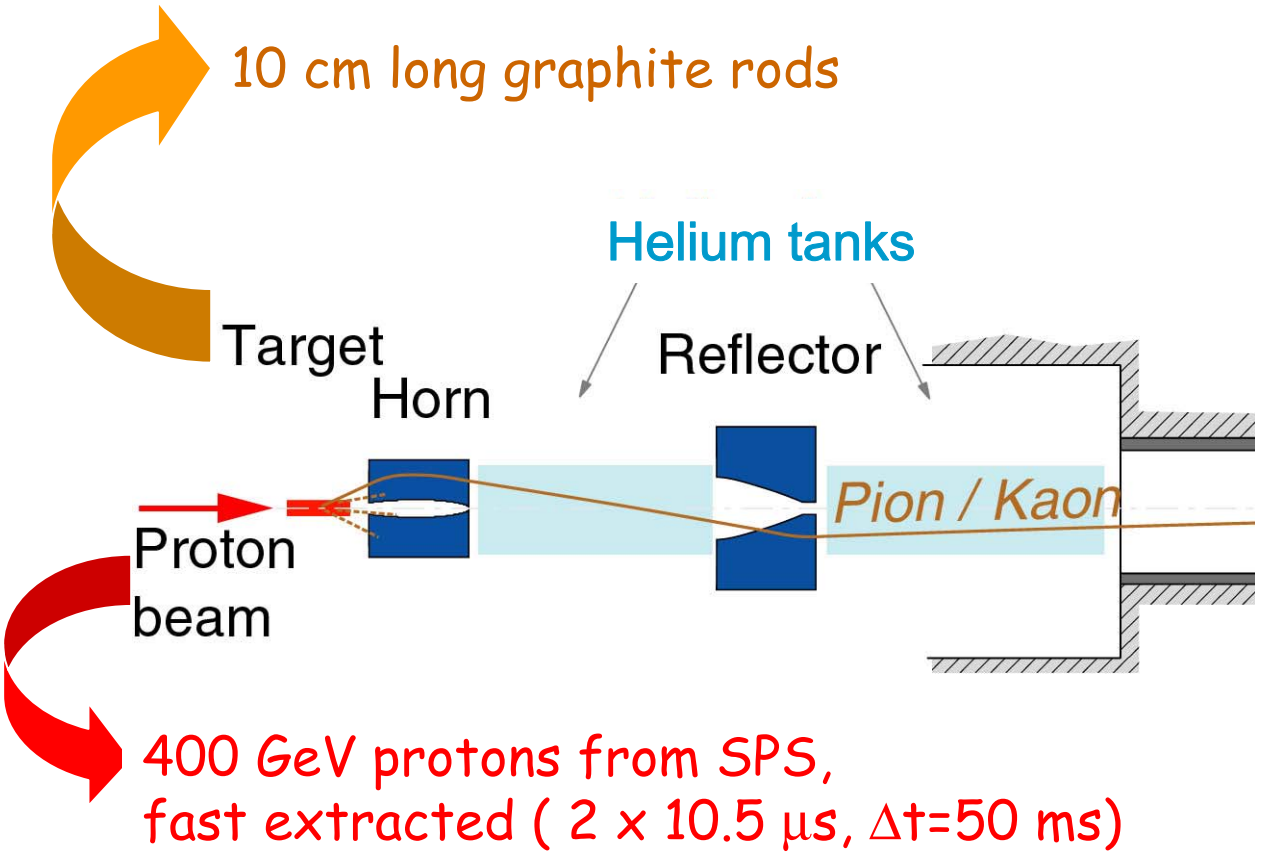
CNGS Overview

Konrad Elsener

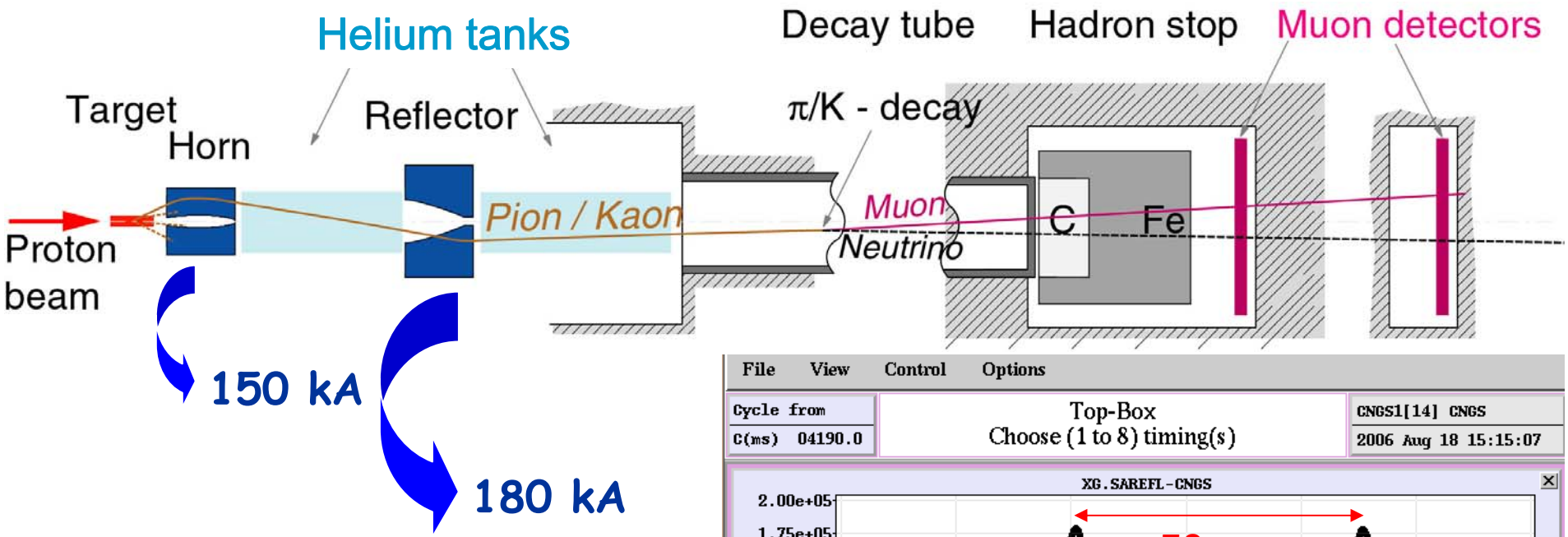
OUTLINE

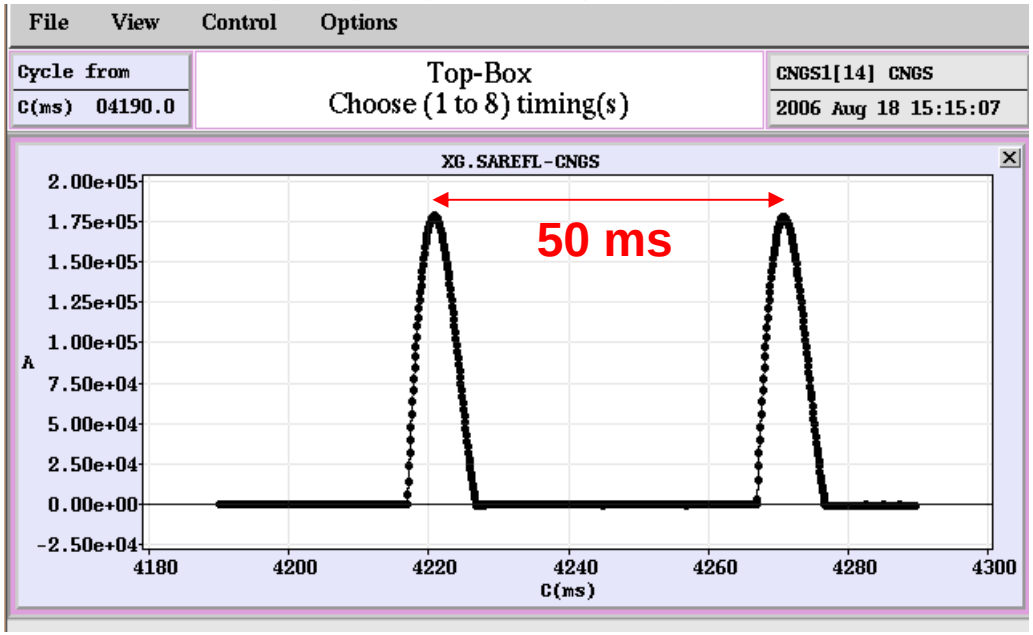
1. The CNGS beam
2. Schedule
3. Status
4. Summary

1. The CNGS beam – main components

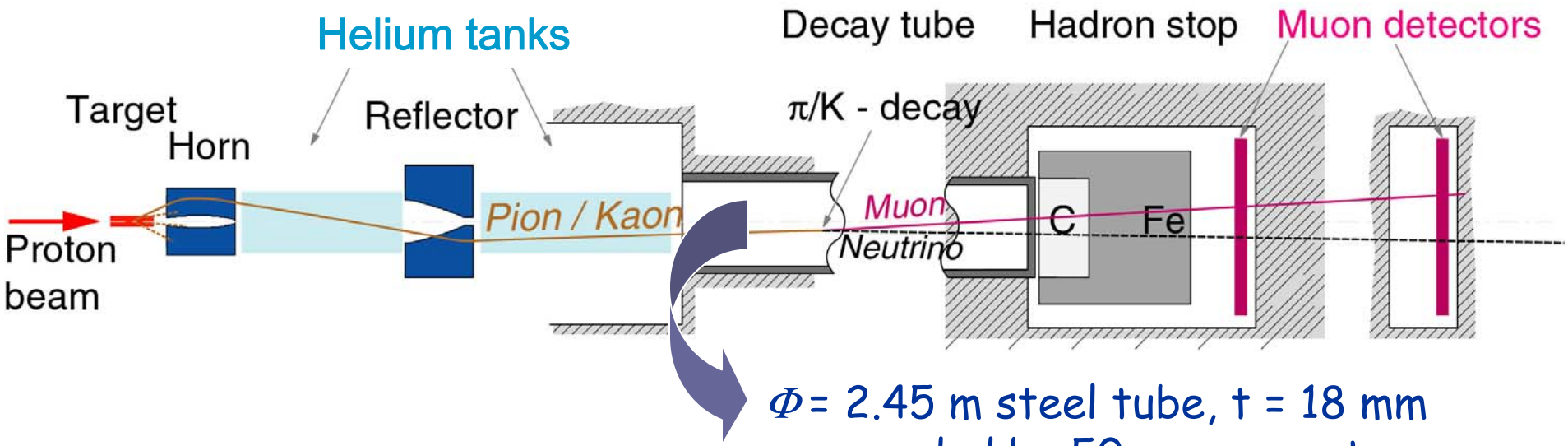


1. The CNGS beam – main components





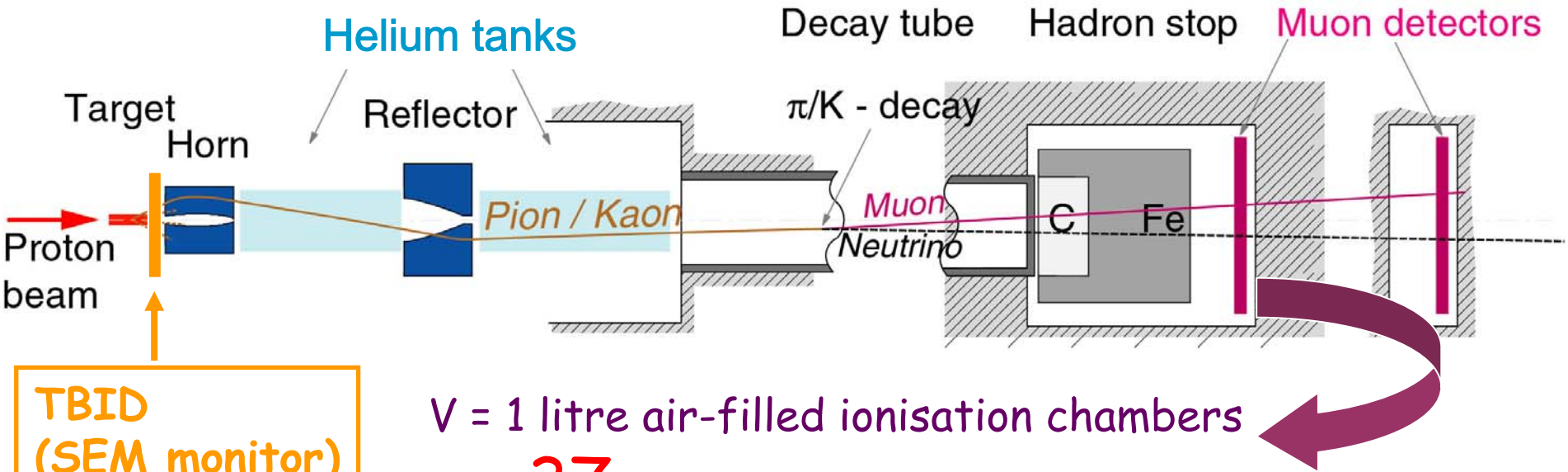
1. The CNGS beam – main components



Φ = 2.45 m steel tube, t = 18 mm
surrounded by 50 cm concrete;
- NO COOLING -
vacuum 1 mbar
entrance window 3 mm Ti
exit window 50 mm steel

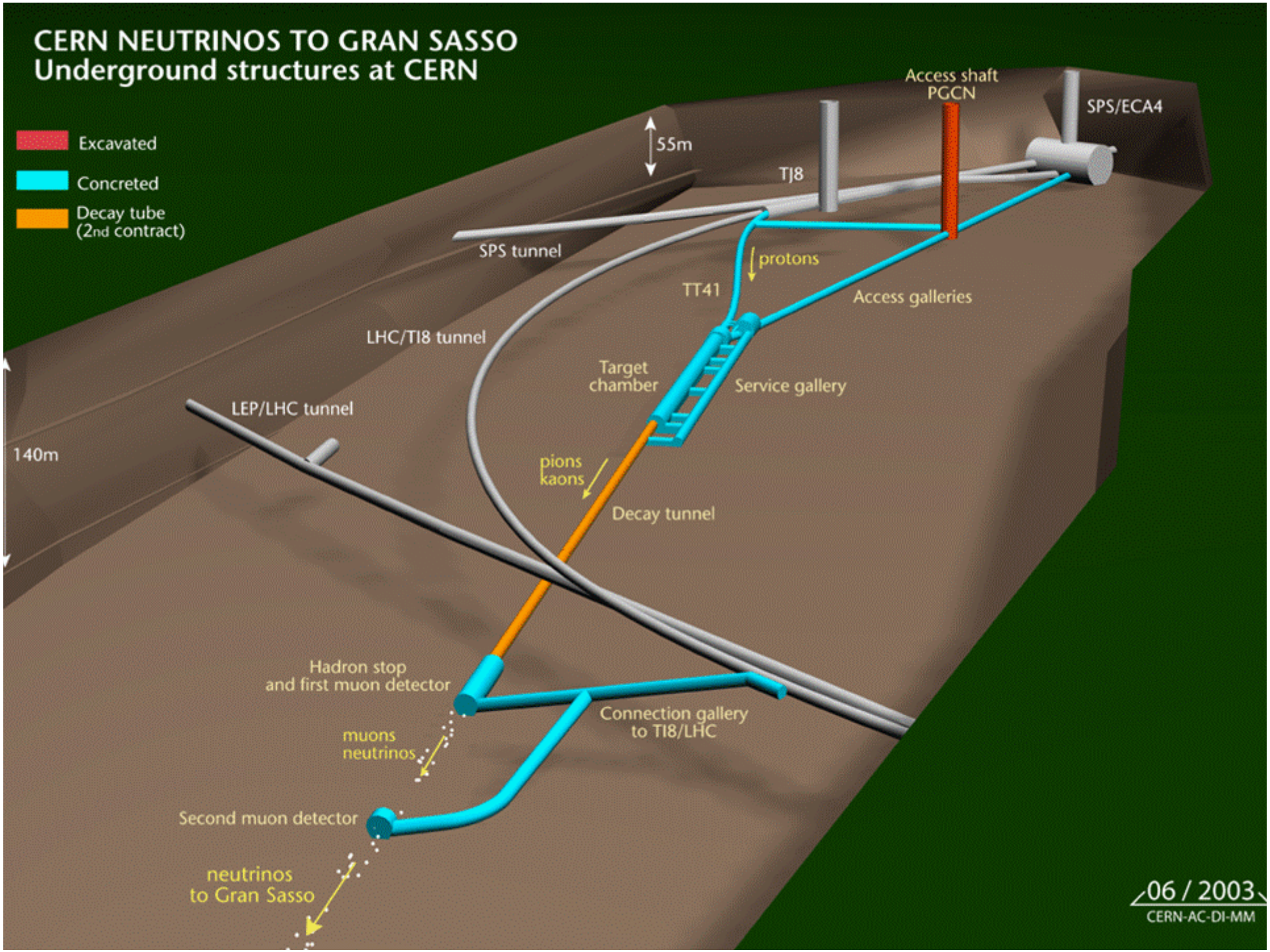
1. The CNGS beam – main components

800 m 100 m 1000m 67 m

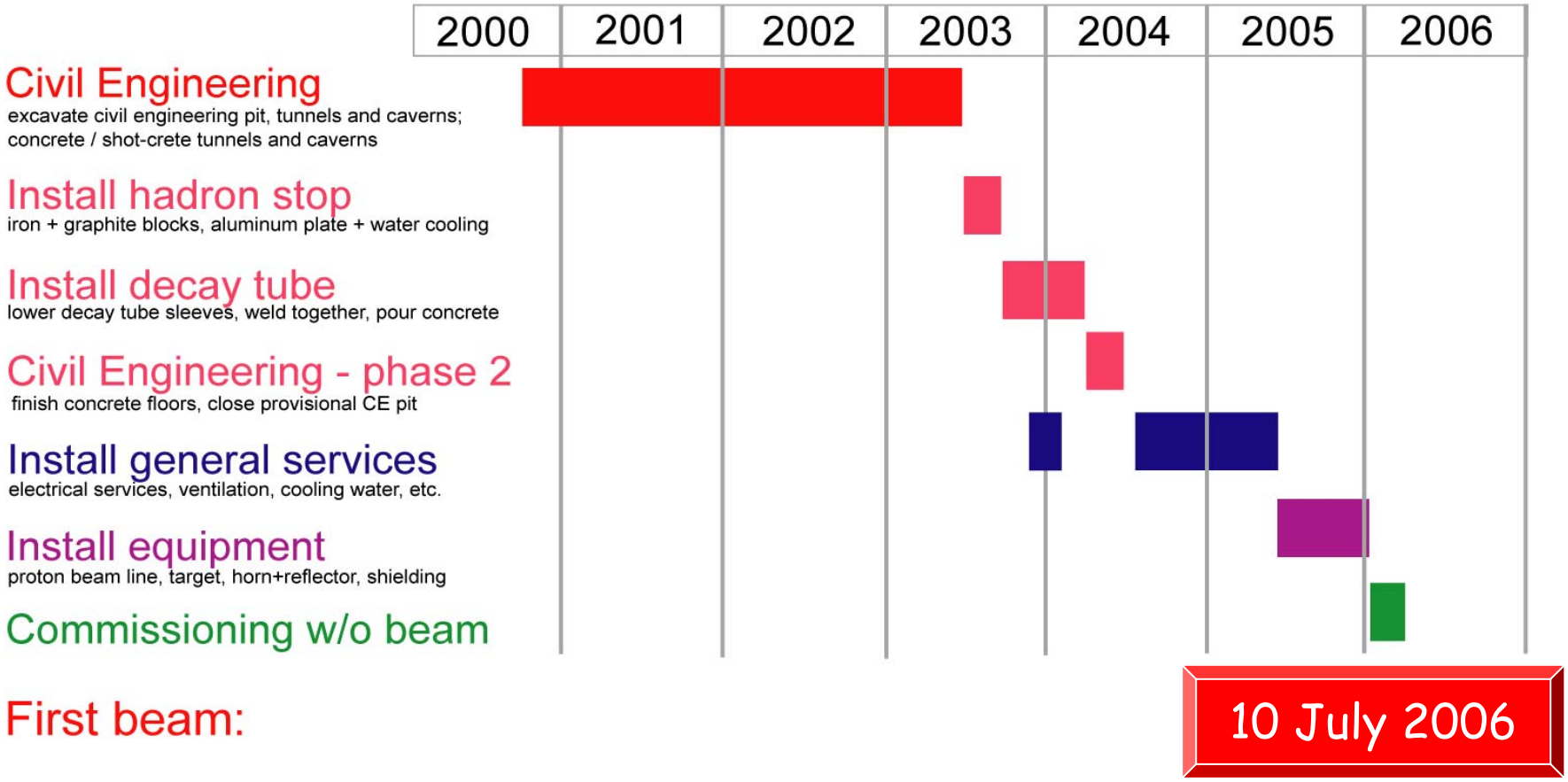


V = 1 litre air-filled ionisation chambers

(17->37 fixed + 1 moveable detector in both muon detection chambers)


CERN NEUTRINOS TO GRAN SASSO
Underground structures at CERN
Excavated
Concreted
Decay tube
(2nd contract)
55m
Access shaft
PGCN
SPS/ECA4
TI8
SPS tunnel
protons
TT41
Access galleries
LHC/TI8 tunnel
Target
chamber
Service gallery
LEP/LHC tunnel
140m
pions
kaons
Decay tunnel
Hadron stop
and first muon detector
Connection gallery
to TI8/LHC
muons
neutrinos
Second muon detector
neutrinos
to Gran Sasso
06 / 2003
CERN-AC-DI-MM

2. Schedule


2000
2001
2002
2003
2004
2005
2006
Civil Engineering
excavate civil engineering pit, tunnels and caverns;
concrete / shot-crete tunnels and caverns
Install hadron stop
iron + graphite blocks, aluminum plate + water cooling
Install decay tube
lower decay tube sleeves, weld together, pour concrete
Civil Engineering - phase 2
finish concrete floors, close provisional CE pit
Install general services
electrical services, ventilation, cooling water, etc.
Install equipment
proton beam line, target, horn+reflector, shielding
Commissioning w/o beam
First beam:
10 July 2006

3. Status

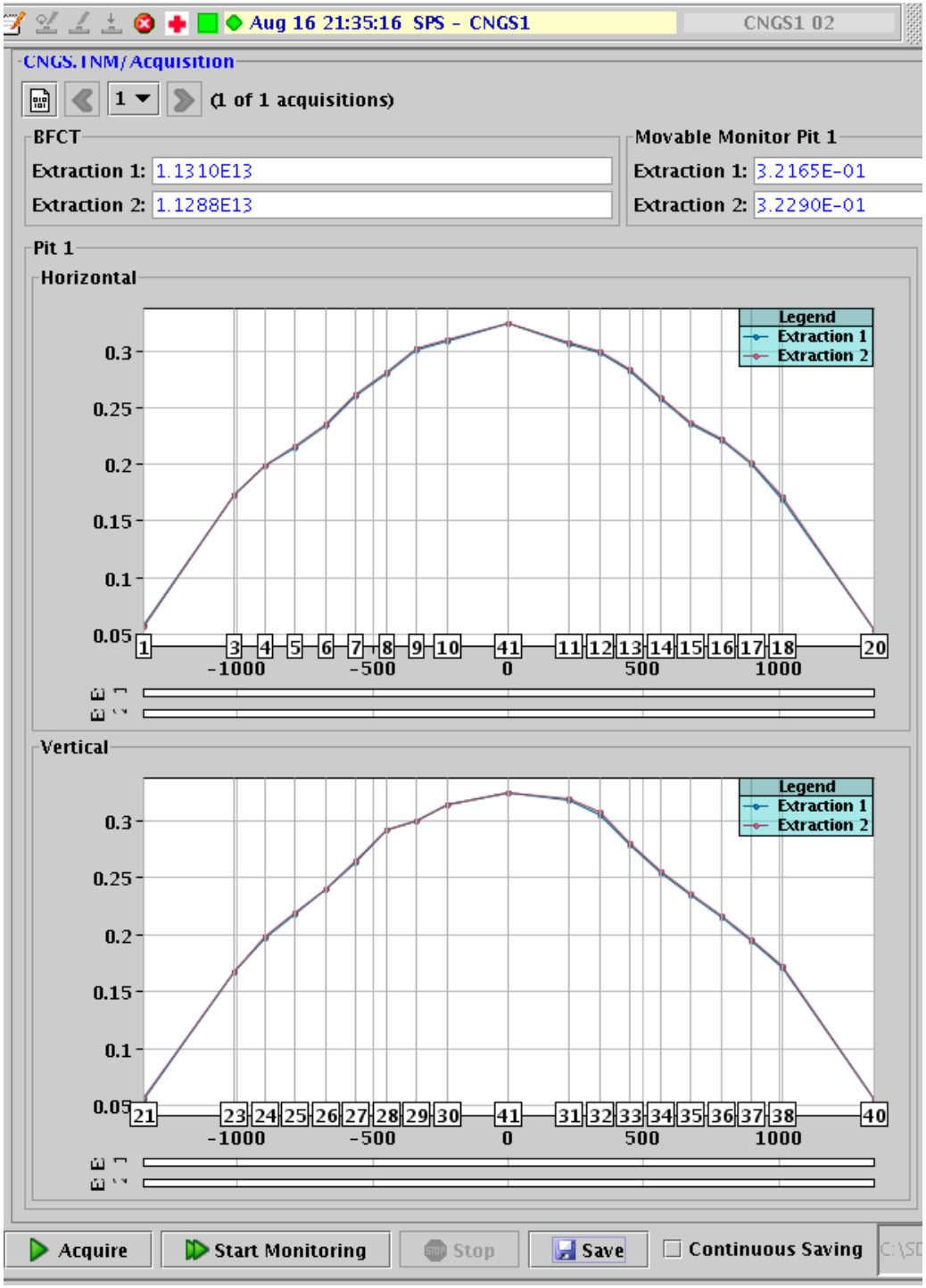
construction:

completed

commissioning:

done

CNGS operational !

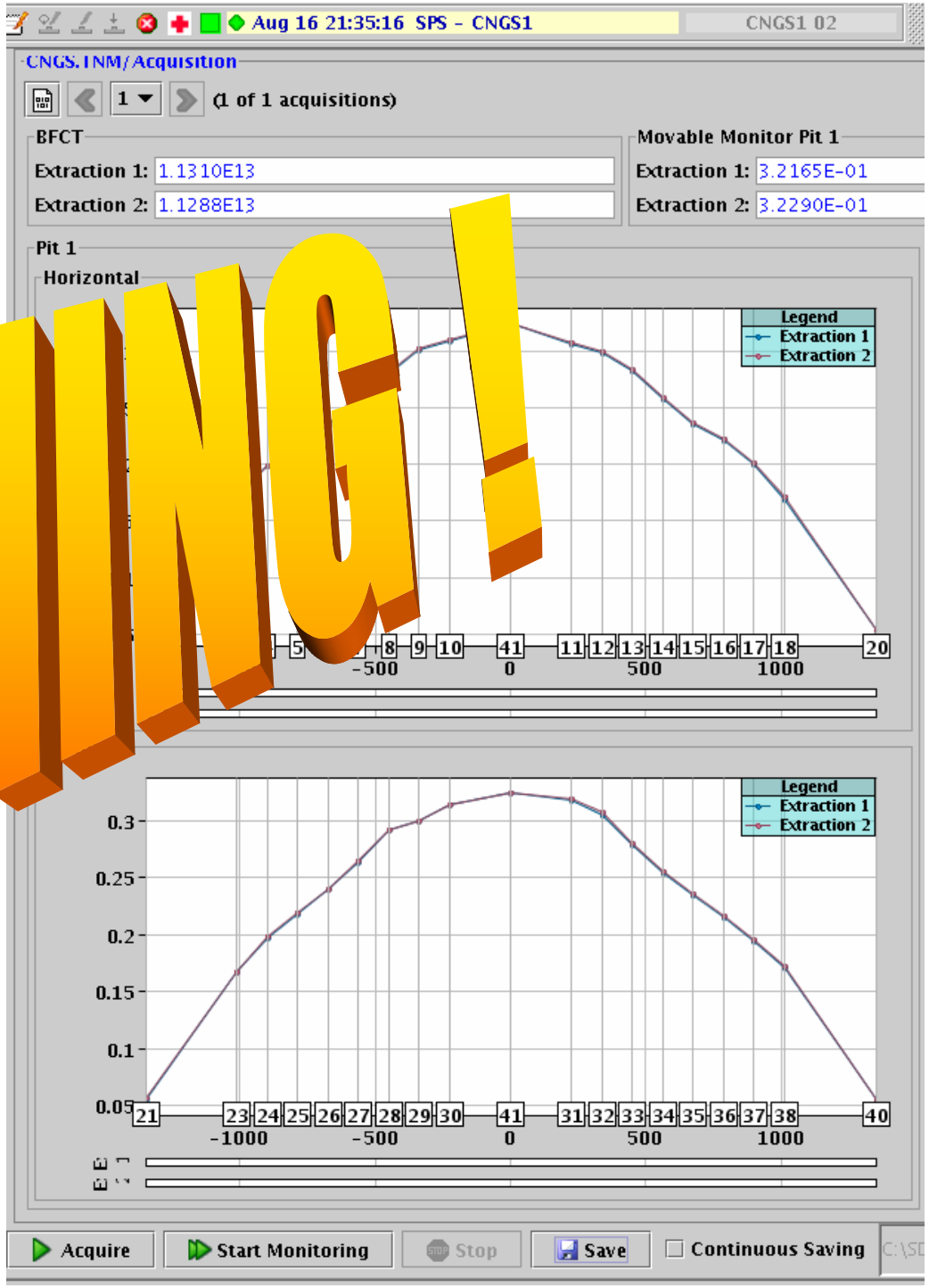


3. Status

construction:

commi

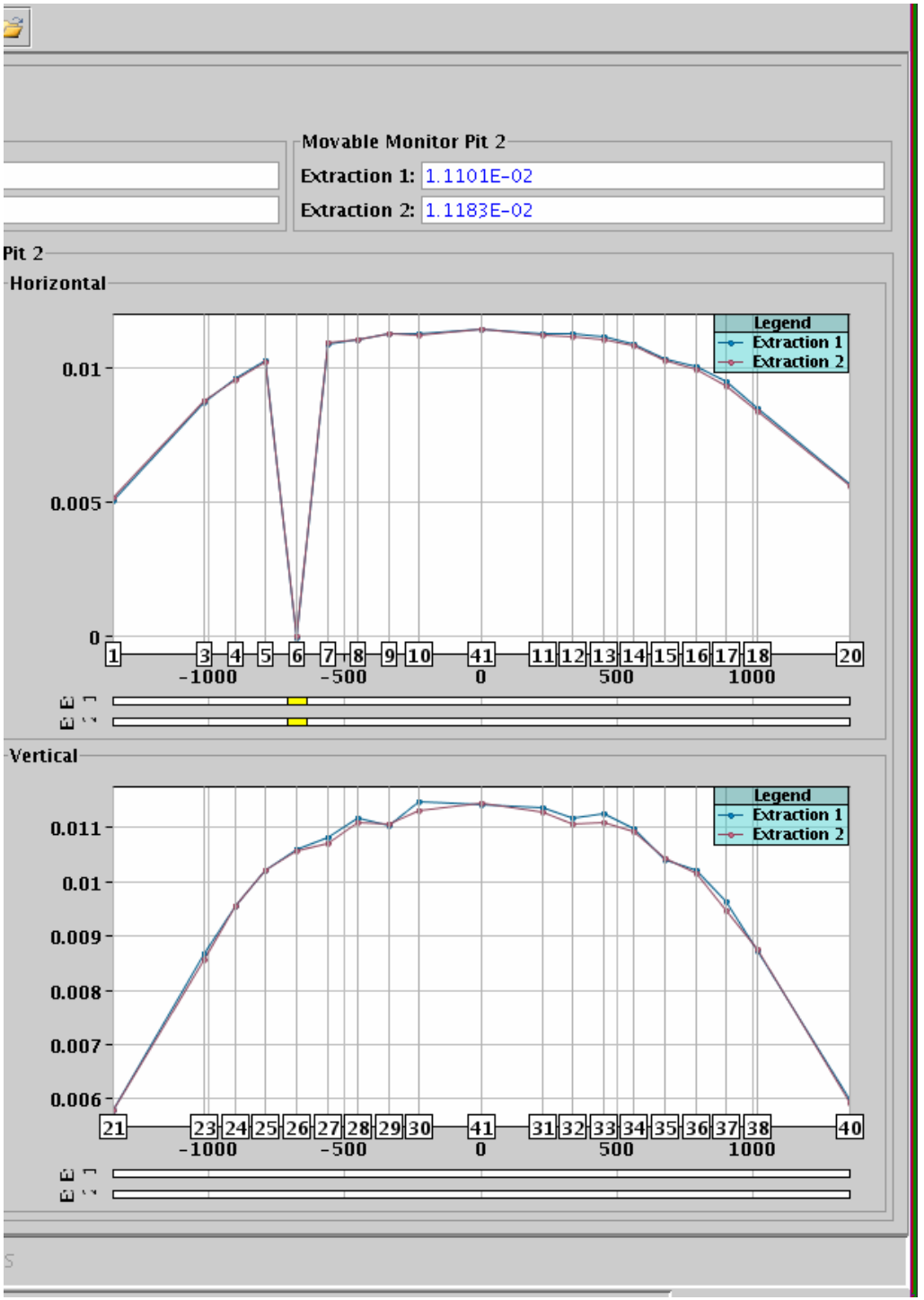
CNGS [illegible]ational !



3a. Status

BPM: not o.k.
BTV: ? not aligned ?
target: not aligned w/beam
not aligned w/horn
horns: polarity wrong,
timing wrong,
alarm (conductivity)
data logging:
missing spills
decay tube pumps:
one "dead"
ventilation: not o.k.
smoke detection: problems

....
05 Sept 2006



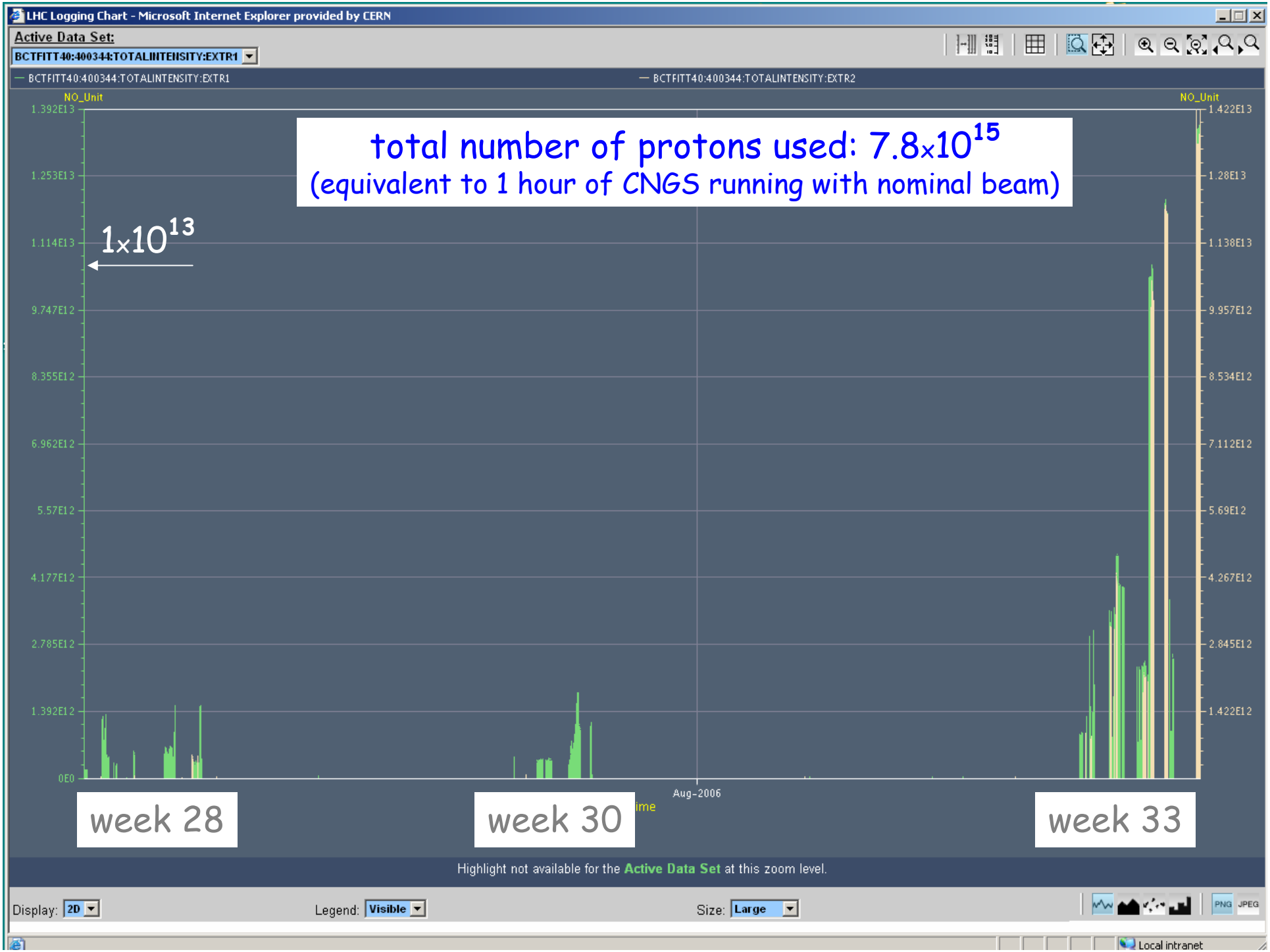
- Hardware commissioning / cold check-out

  Beam instrumentations — Feb. – April 2006
  Power supplies
  Magnets (incl. polarities)
  Vacuum system
  (April / May: Target / Horn exchange excercises “real”)

- “Dry runs” — April – May 2006

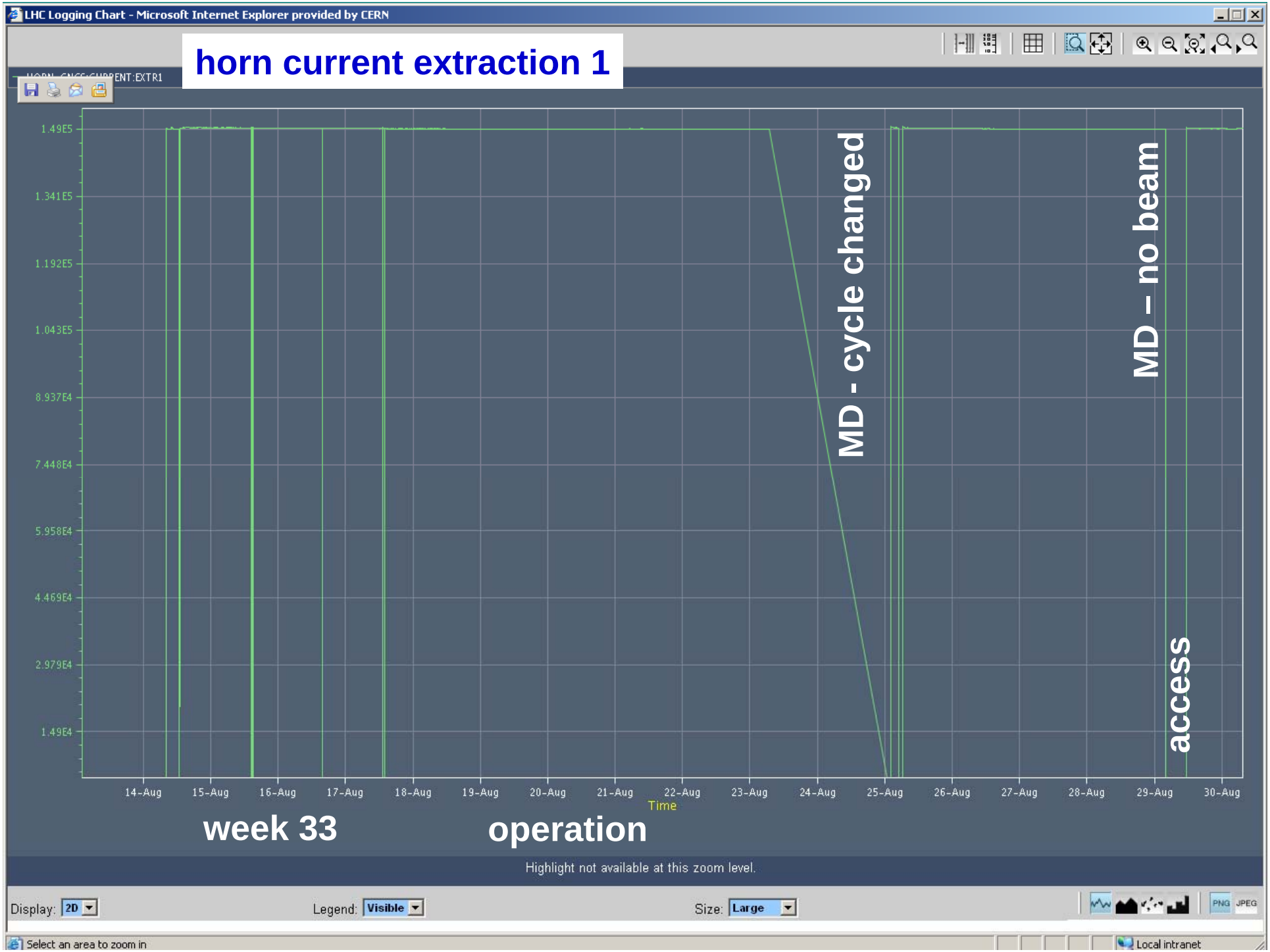
  Timing
  Controls
  Interlocks
  Beam permit
  Magnets (current & polarities)

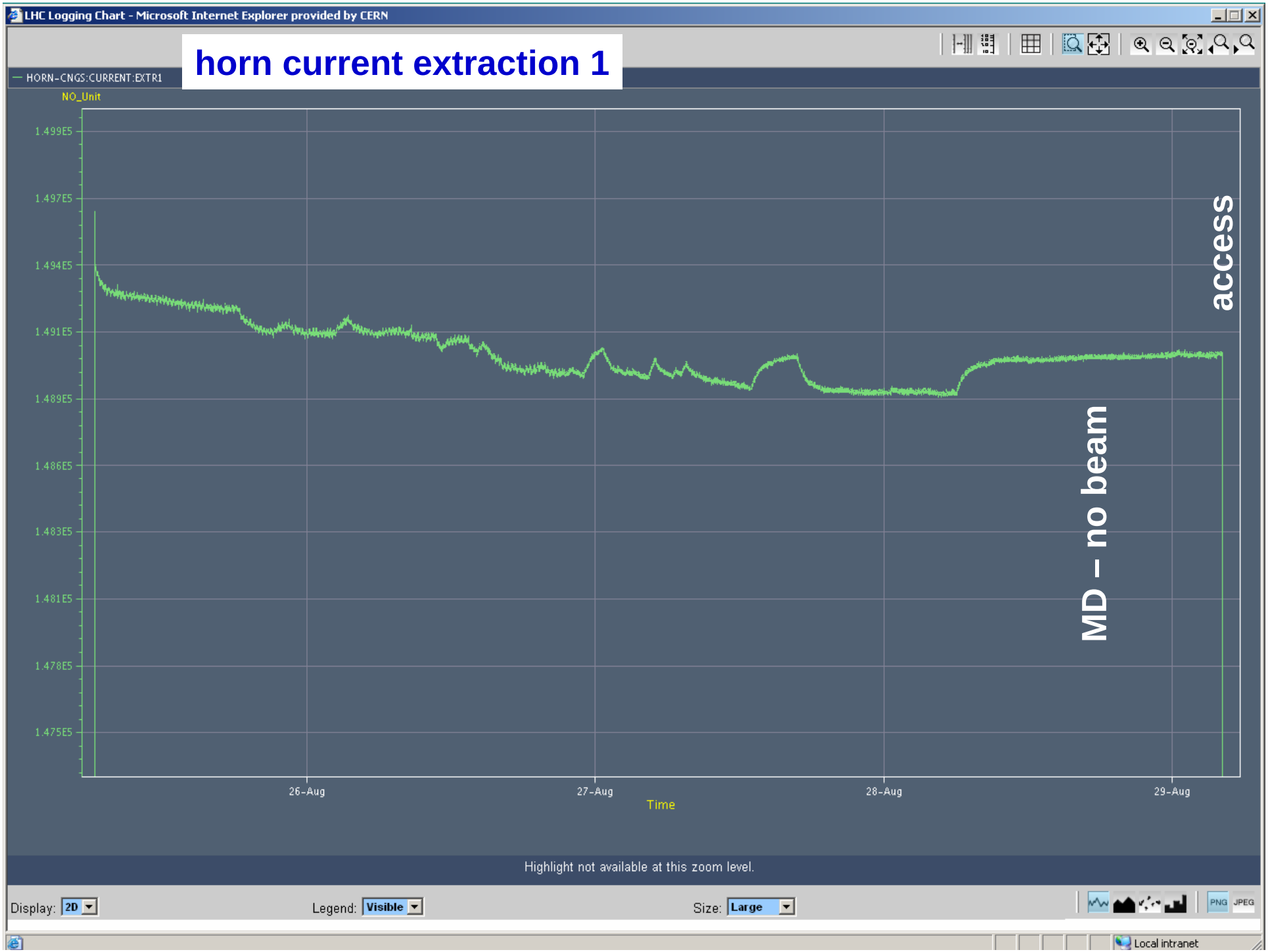
- **Commissioning with beam** 2006: weeks 28, 30 and 33


LHC Logging Chart - Microsoft Internet Explorer provided by CERN
Active Data Set:
BCTFITT40:400344:TOTALINTENSITY:EXTR1
BCTFITT40:400344:TOTALINTENSITY:EXTR1
BCTFITT40:400344:TOTALINTENSITY:EXTR2
NO_Unit
NO_Unit
1.392E13
1.253E13
1.114E13
9.747E12
8.355E12
6.962E12
5.57E12
4.177E12
2.785E12
1.392E12
0E0
1.422E13
1.28E13
1.138E13
9.957E12
8.534E12
7.112E12
5.69E12
4.267E12
2.845E12
1.422E12
total number of protons used: 7.8x10^15
(equivalent to 1 hour of CNGS running with nominal beam)
1x10^13
Aug-2006
week 28
week 30
week 33
Highlight not available for the Active Data Set at this zoom level.
Display: 2D
Legend: Visible
Size: Large
PNG
JPEG
Local intranet

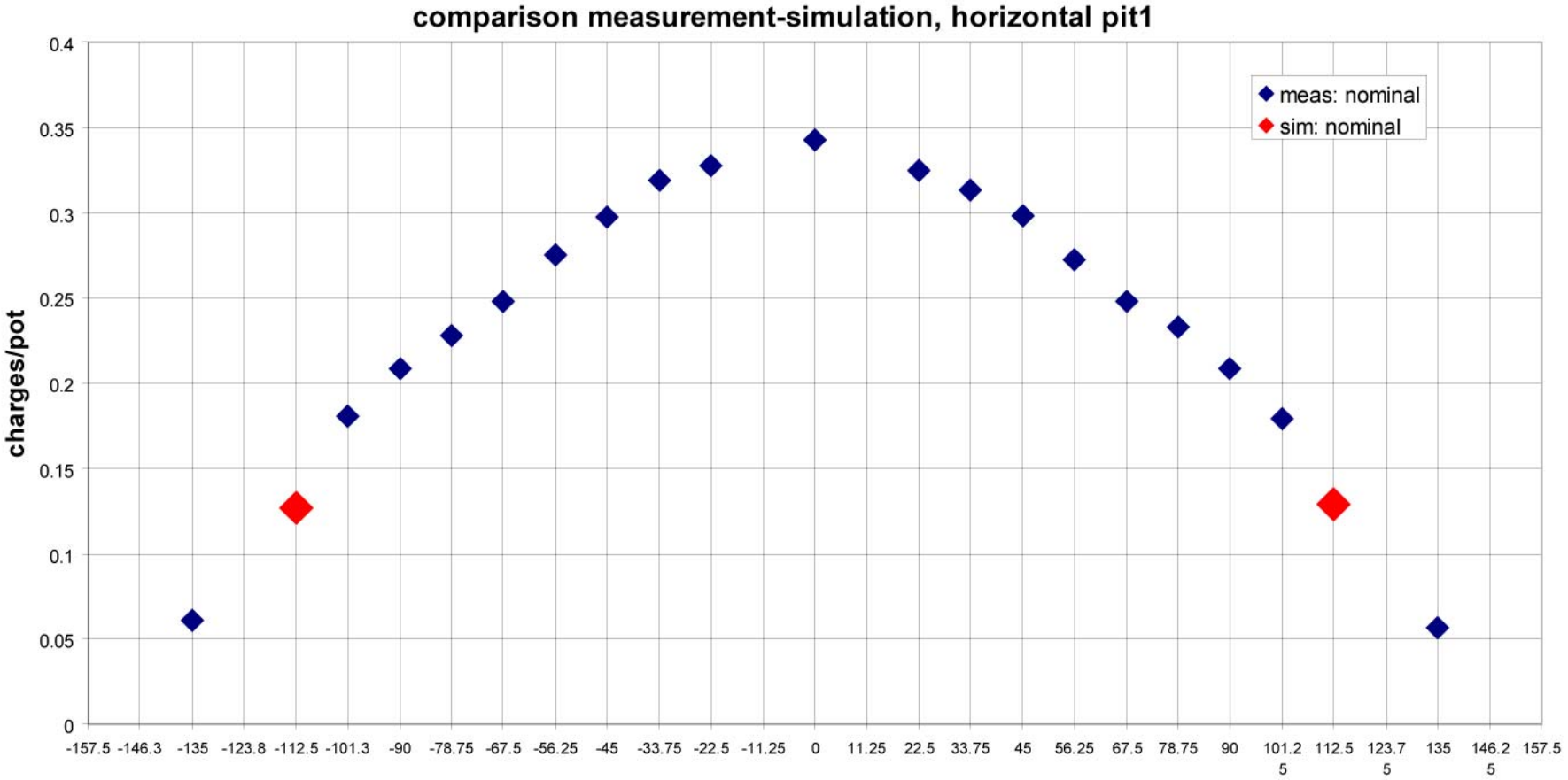
how did we use these "few" protons ?

... answers throughout this workshop ...


LHC Logging Chart - Microsoft Internet Explorer provided by CERN
horn current extraction 1
1.49E5
1.341E5
1.192E5
1.043E5
8.937E4
7.448E4
5.958E4
4.469E4
2.979E4
1.49E4
MD - cycle changed
MD – no beam
access
14-Aug
15-Aug
16-Aug
17-Aug
18-Aug
19-Aug
20-Aug
21-Aug
22-Aug
23-Aug
24-Aug
25-Aug
26-Aug
27-Aug
28-Aug
29-Aug
30-Aug
Time
week 33
operation
Highlight not available at this zoom level.
Display: 2D
Legend: Visible
Size: Large
PNG JPEG
Select an area to zoom in
Local intranet


LHC Logging Chart - Microsoft Internet Explorer provided by CERN
horn current extraction 1
HORN-CNGS:CURRENT:EXTR1
NO_Unit
1.499E5
1.497E5
1.494E5
1.491E5
1.489E5
1.486E5
1.483E5
1.481E5
1.478E5
1.475E5
26-Aug
27-Aug
28-Aug
29-Aug
Time
access
MD – no beam
Highlight not available at this zoom level.
Display: 2D
Legend: Visible
Size: Large
PNG
JPEG
Local intranet

Quality check – muon monitors (example: Pit 1 - horizontal plane)



data <> Fluka

PRELIMINARY

more on Friday, 8 Sept. (Edda's talk)

... other problems ... (construction)

February 2006:	safety shutter -> not on safe power (!) decay tube air-inlet "local controls"
March 2006:	helium purity BAD (weather changed...)
30 June 2006:	hadron stop water leak **(flowmeters)**

... more problems ... (commissioning)

MKE kickers not working reliably – fixed "last minute"

beam availability from the PS + SPS (PS septum change, etc.)

radioactive cooling water from the TED (beam dump in extr. line)

two out of 4 air-cooling units in the service gallery have a fault

details of TBID readout still need to be understood (electronics?)

... on the sunny side: "everything works"!

-> was wonderful to see how smoothly the proton beam came on

-> impressive (to me) to see the tools at work for proton beam analysis

-> little trouble moving/turning the target

-> horn + reflector are working reliably

-> beam interlock system is a success

-> controls systems were rarely a cause of trouble ("dry runs" paid off!)

-> it was great to get so many additional muon monitors in week 29 !

4. Summary

CNGS project was approved in December 1999

Civil Engineering – Equipment design – production
- installation phases lasted 6 years

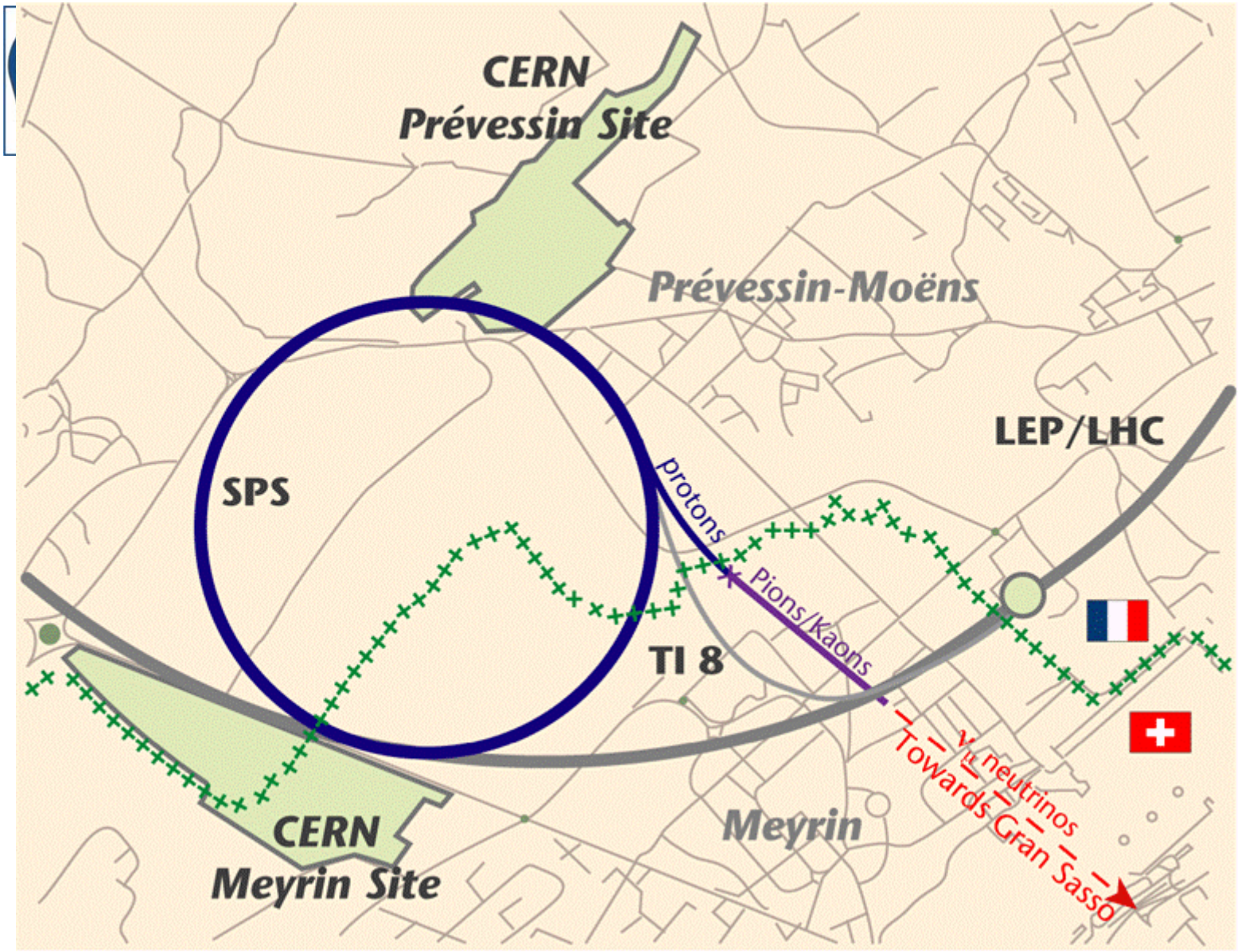
CNGS completed on budget and within the 2002 schedule.

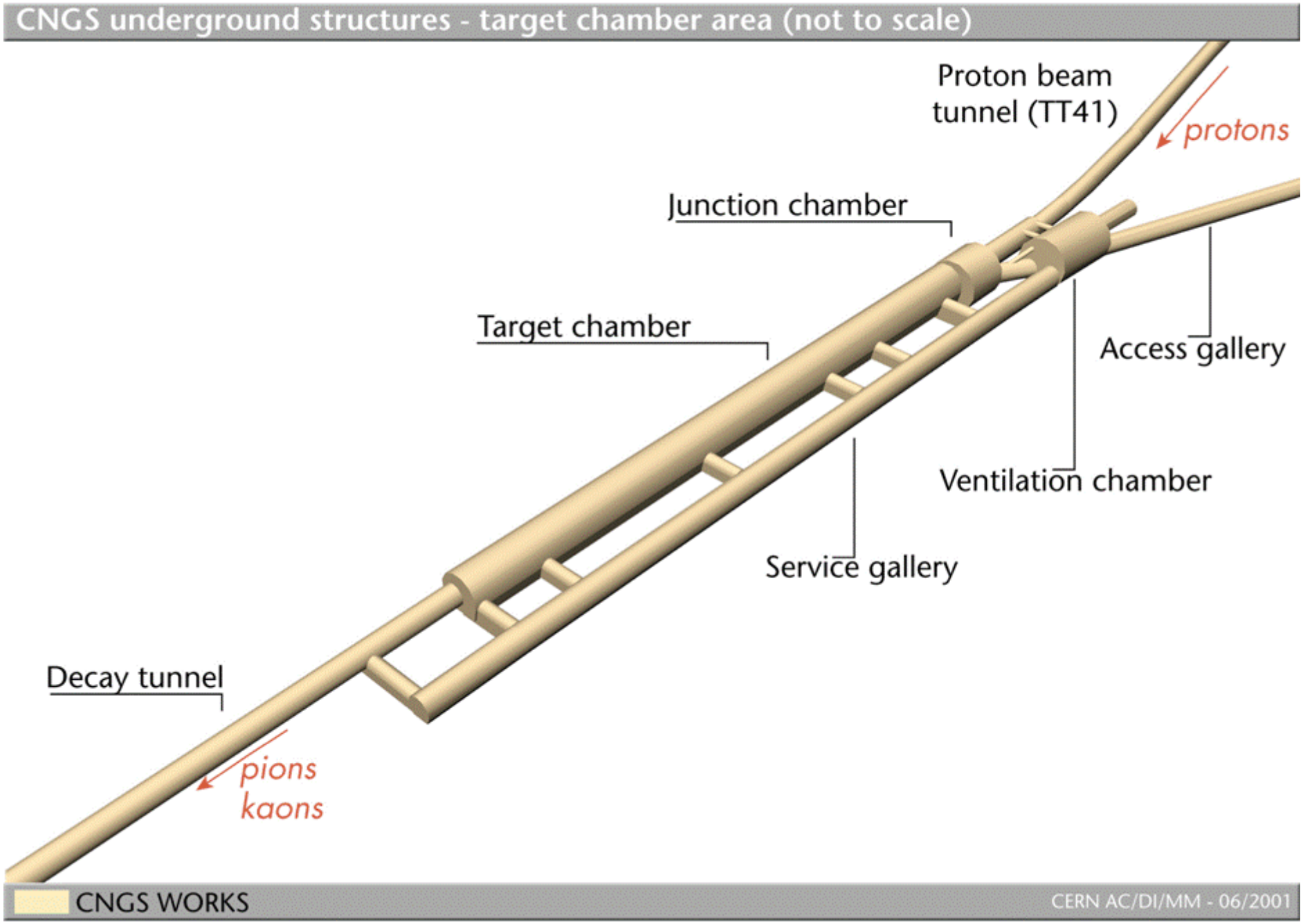
two of our "main worries" at NBI2005 are gone
(target / horns ready and installed in time)
the two other "main worries" remain
(target chamber heating/cooling calculations,
decay tube heating + stresses)

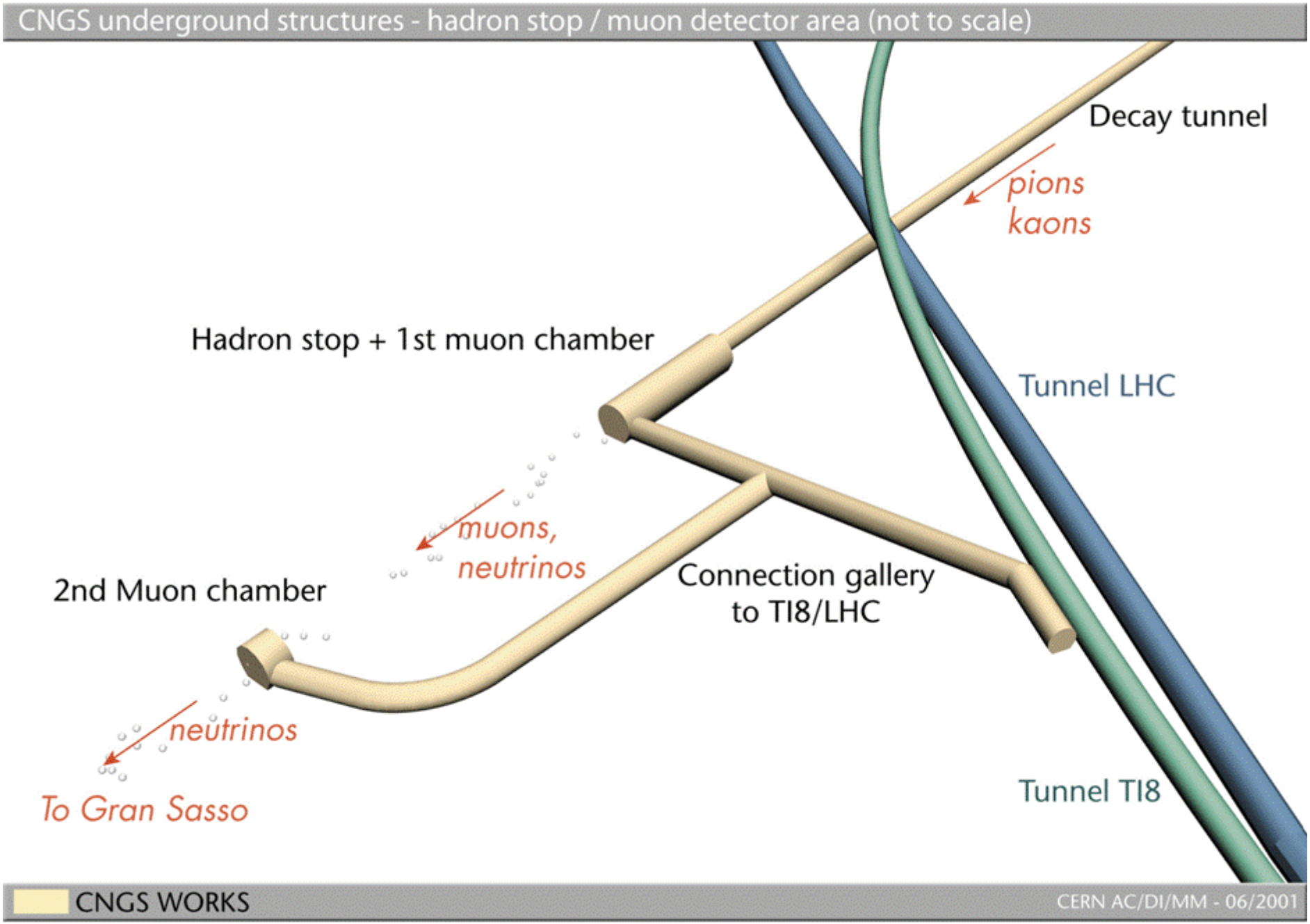
Lesson learned: hardware commissioning for "services" !!!

CNGS is operational – but the toughest part is still ahead !

Thank you !


CERN
Prévessin Site
Prévessin-Moëns
LEP/LHC
SPS
protons
Pions/Kaons
TI 8
CERN
Meyrin Site
Meyrin
Towards Gran Sasso
ν neutrinos


CNGS underground structures - target chamber area (not to scale)
Proton beam tunnel (TT41)
protons
Junction chamber
Target chamber
Access gallery
Ventilation chamber
Service gallery
Decay tunnel
pions
kaons
CNGS WORKS
CERN AC/DI/MM - 06/2001


CNGS underground structures - hadron stop / muon detector area (not to scale)
Decay tunnel
pions
kaons
Hadron stop + 1st muon chamber
Tunnel LHC
muons,
neutrinos
2nd Muon chamber
Connection gallery
to TI8/LHC
neutrinos
To Gran Sasso
Tunnel TI8
CNGS WORKS
CERN AC/DI/MM - 06/2001

p.o.t. (1st extr.)

horn current [A]