Status of CNGS

Konrad Elsener
CERN – Accelerators+Beams Division


many thanks !

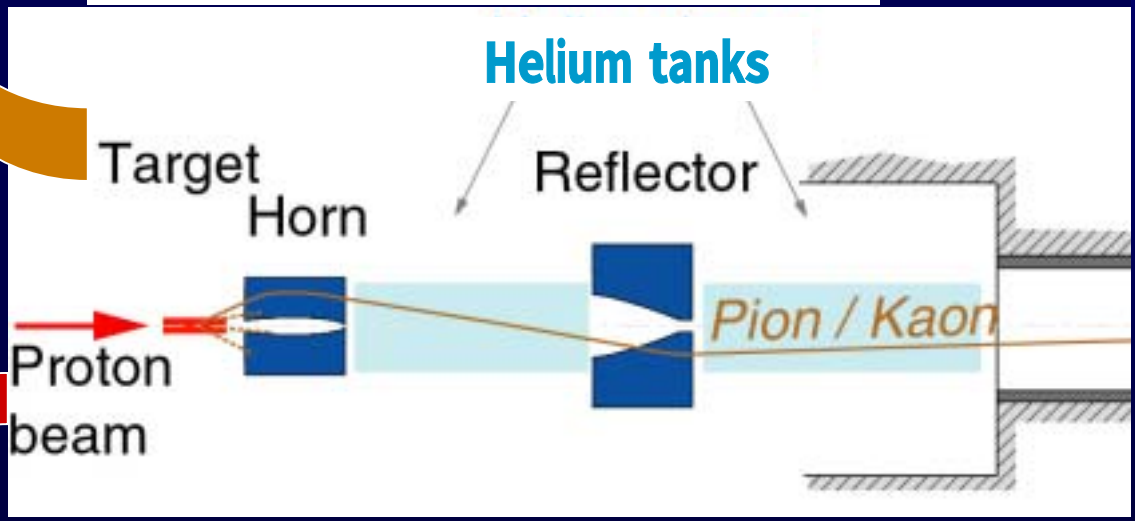
Status of CNGS

OUTLINE

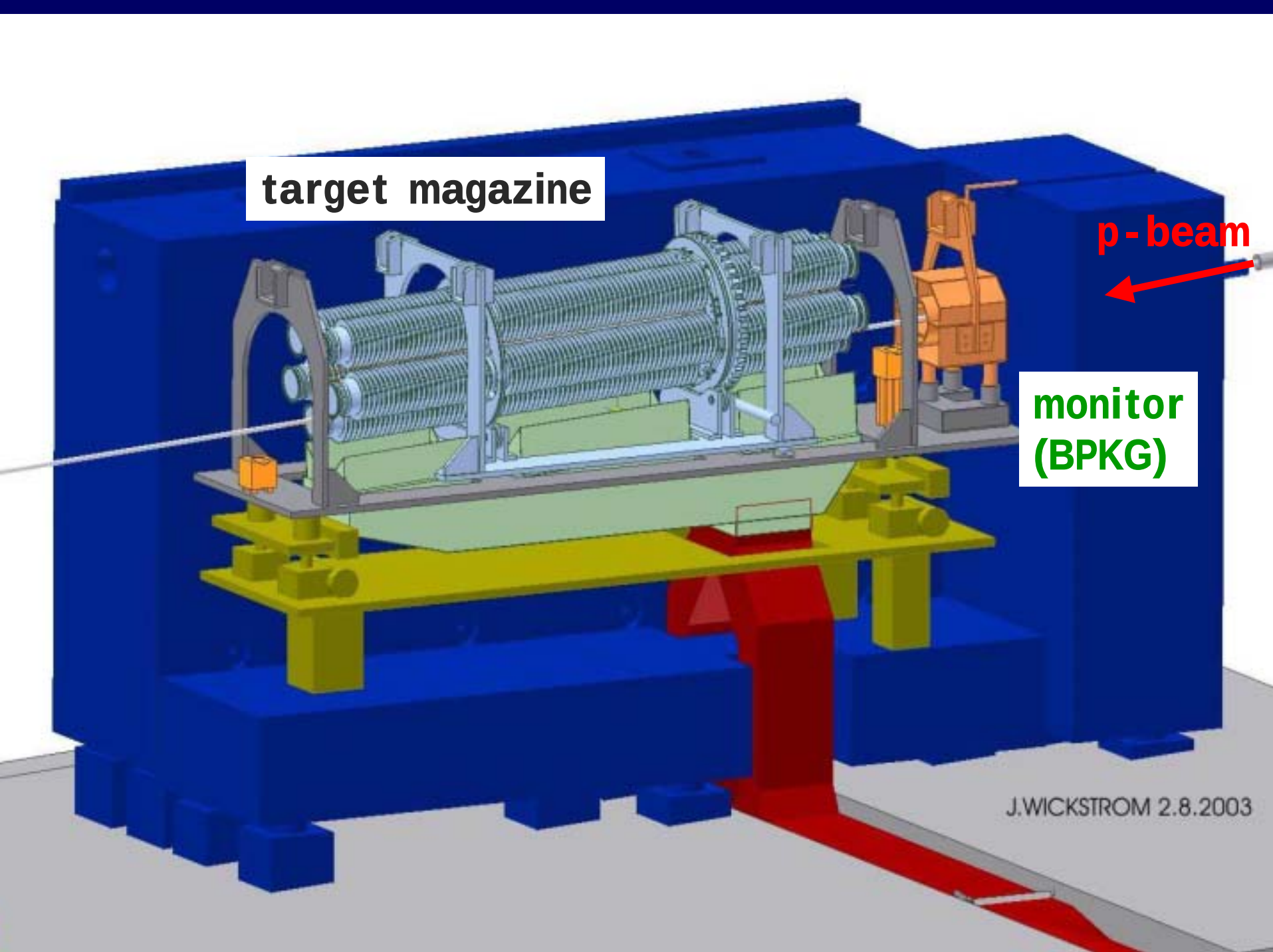
1. The CNGS beam
2. Schedule
3. Status of works
4. Summary

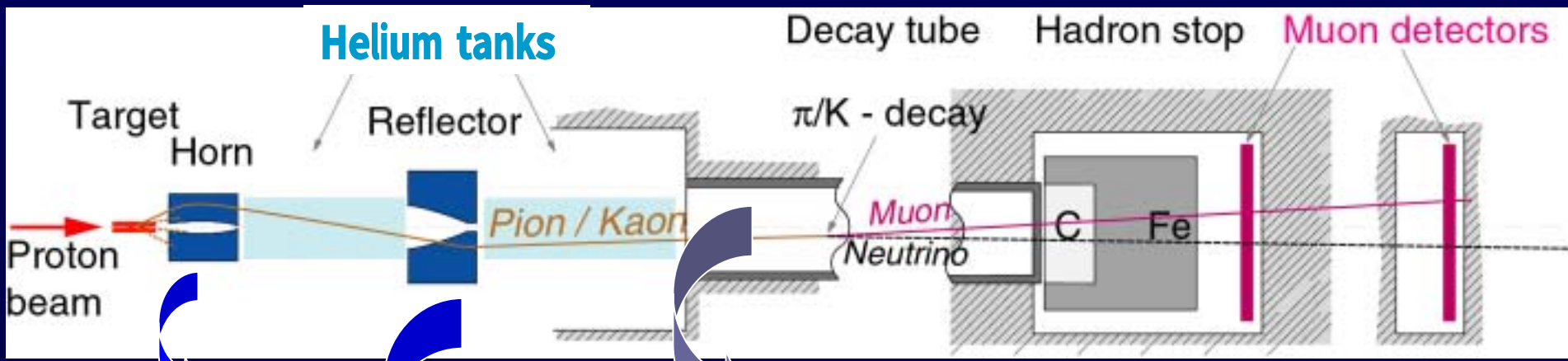
1. The CNGS beam

10 cm long graphite rods
(13 segments, interspaced);
total length 2 m; Φ = 5 / 4 mm



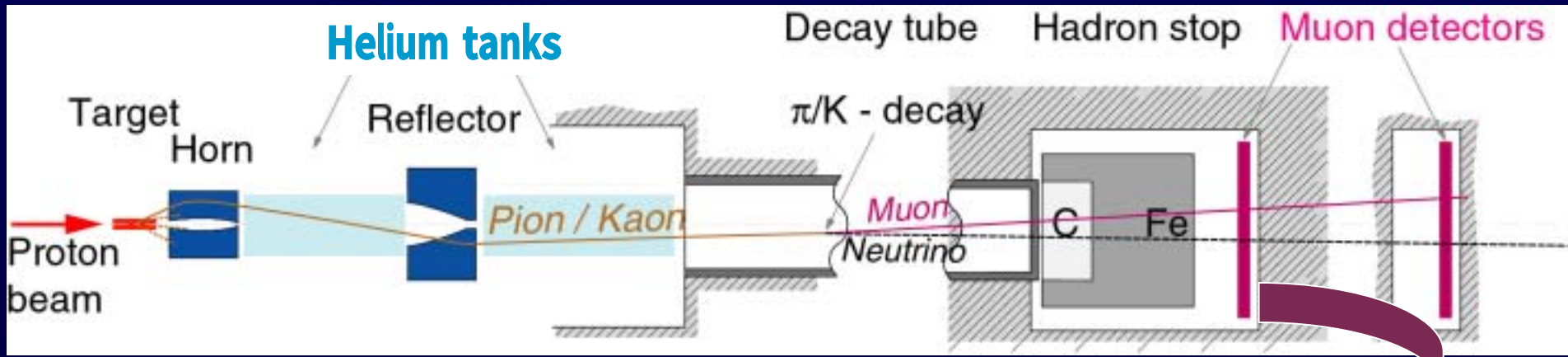
400 GeV protons from SPS,
fast extracted (2 x 10.5 μs, Δt=50 ms)


target magazine
p-beam
monitor
(BPKG)
J.WICKSTROM 2.8.2003

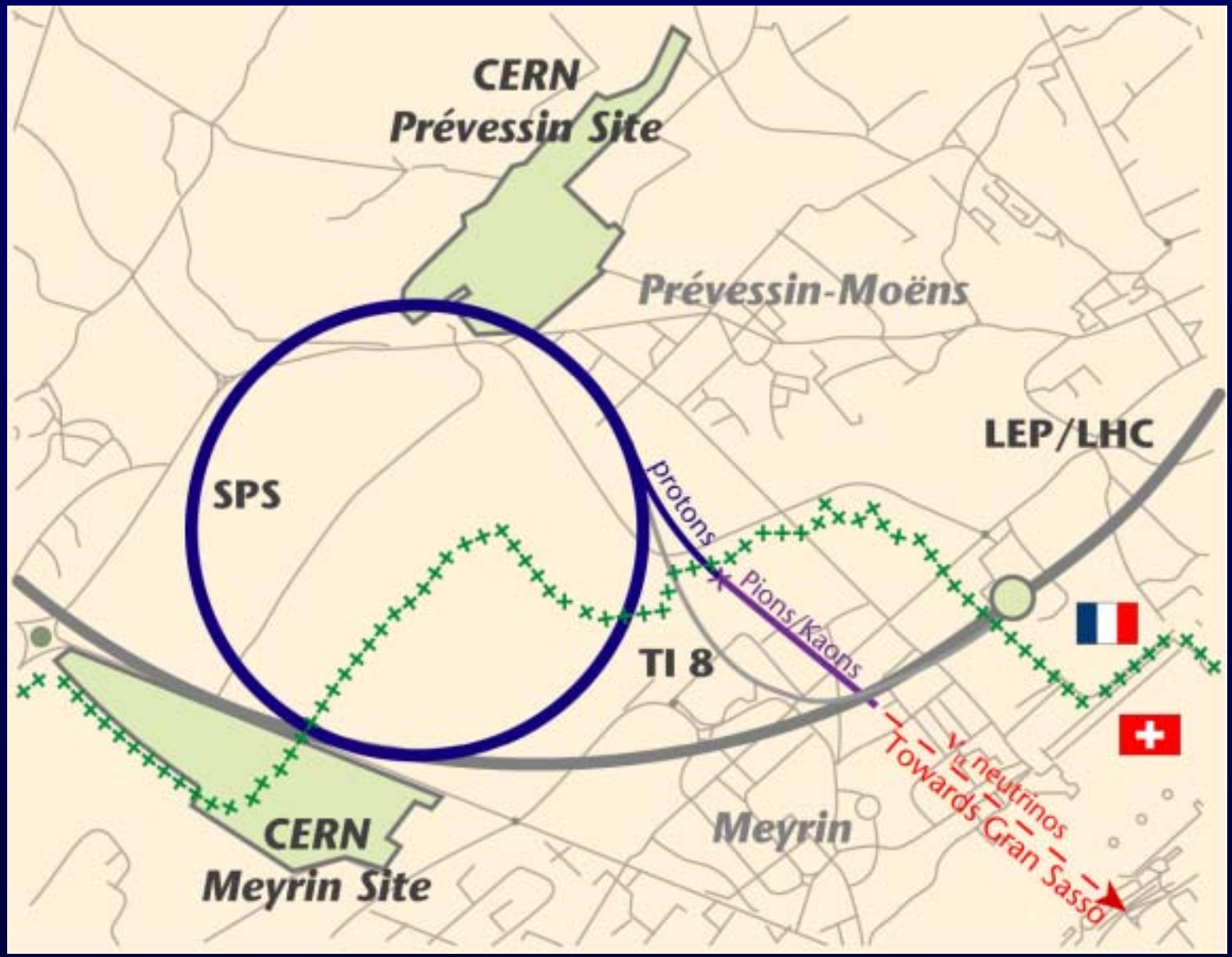


Φ = 2.45 m steel tube, t = 18 mm
surrounded by 50 cm concrete;
- NO COOLING -
vacuum 1 mbar
entrance window 2mm Ti
exit window 50 mm steel

800 m 100 m 1000m 67 m



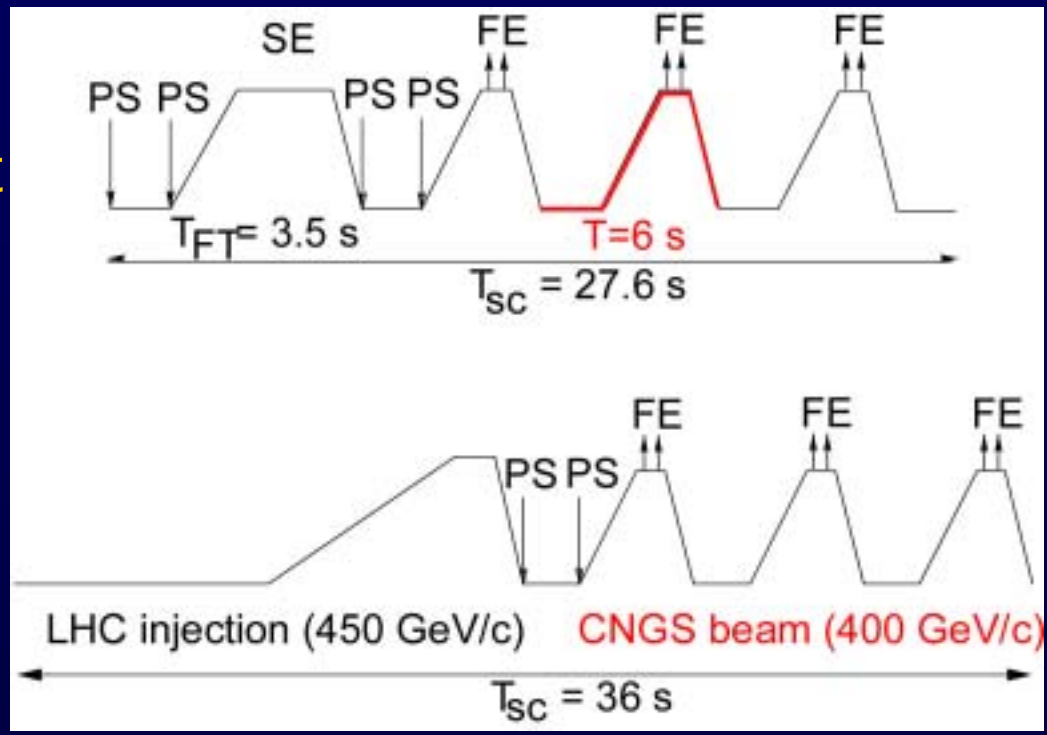
V = 1 litre air-filled ionisation chambers
(17 fixed + 1 moveable detector
in both muon detection chambers)


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

SPS supercycles for CNGS running with Fixed Target or LHC filling

CNGS + fixed target

CNGS + LHC

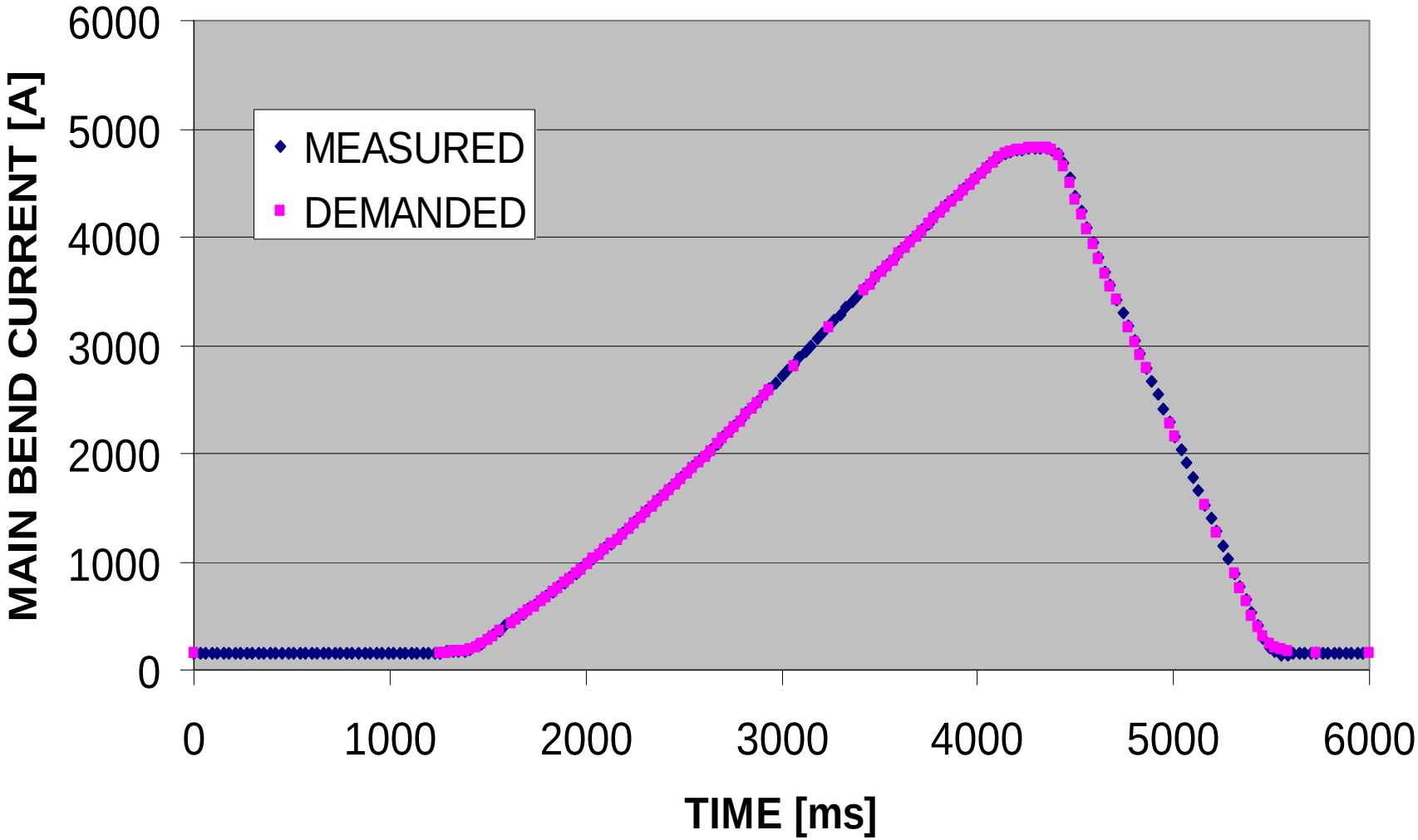


For 1 year of CNGS operation (200 days) we expect:

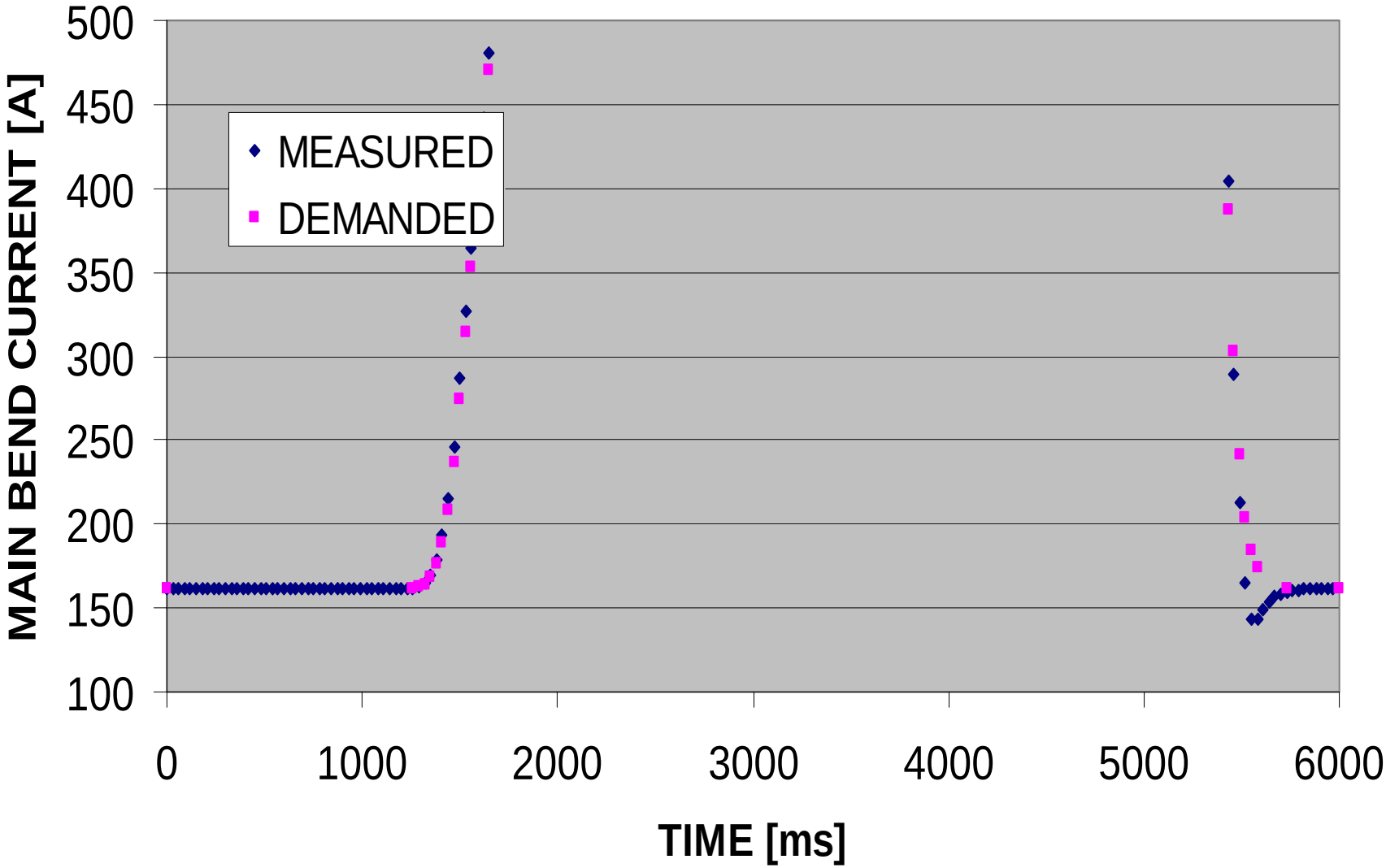
(4.8×10^{13} protons in SPS, 55% efficiency -- 1998)

4.5×10^{19} protons on target ("nominal")

SPS magnet cycle for CNGS – Sept. 2002

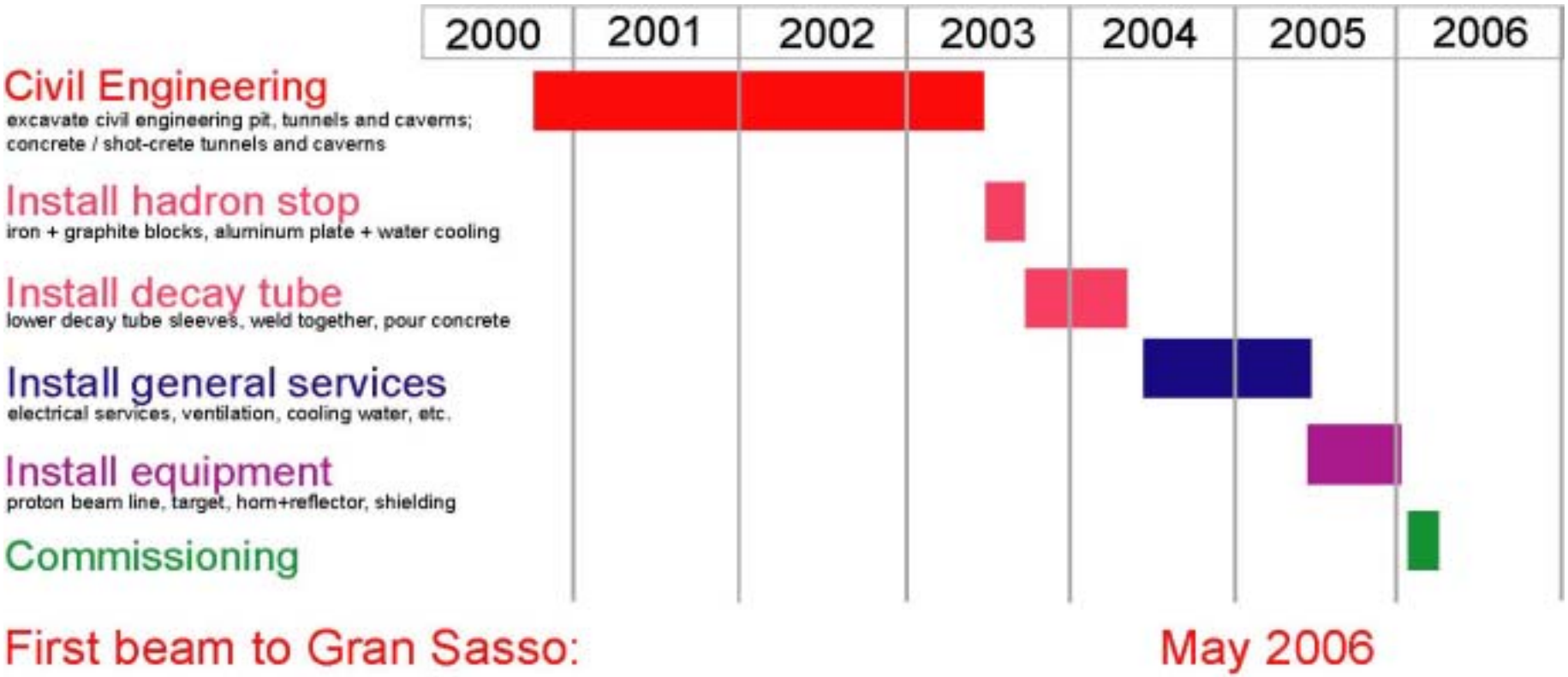


SPS magnet cycle for CNGS – Sept. 2002



2. Schedule

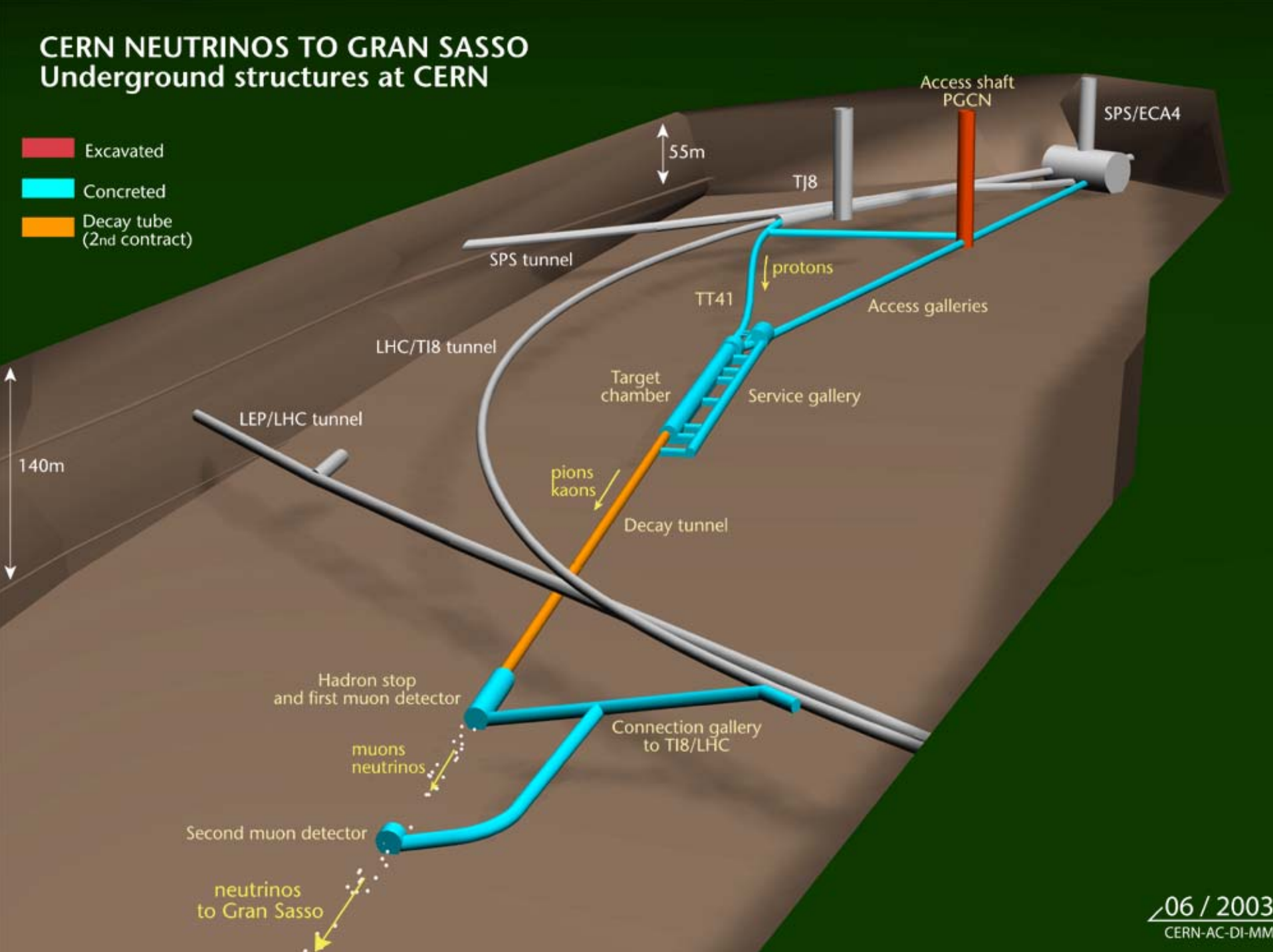
Note: due to PS/SPS stop in 2005 (decided in June 2002)
-> start of CNGS now planned for 2006 instead of 2005



3. Status of works

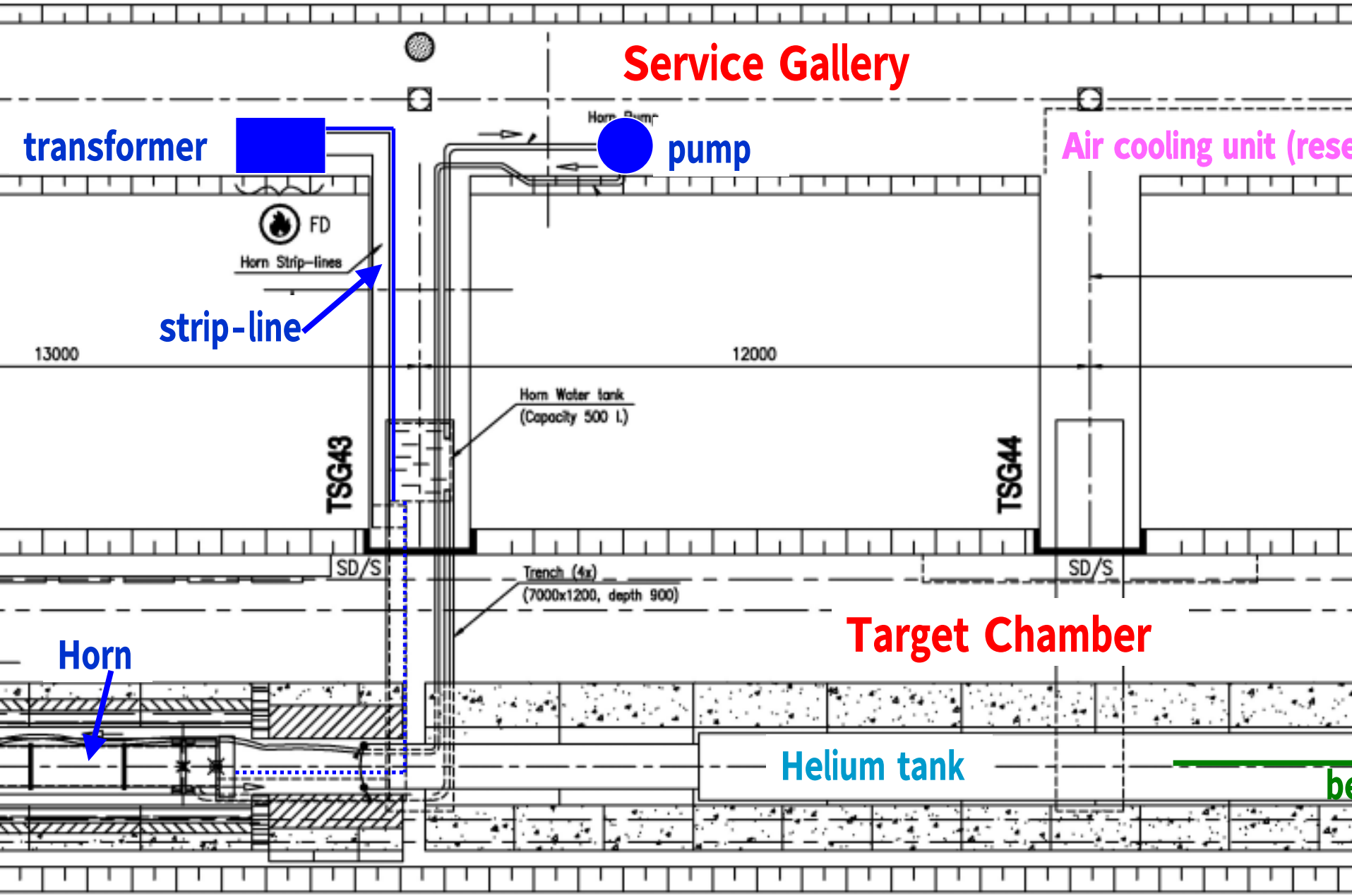
3a. Civil Engineering – Phase I

12 October 2000


CERN NEUTRINOS TO GRAN SASSO
Underground structures at CERN
Excavated
Concreted
Decay tube
(2nd contract)
Access shaft
PGCN
SPS/ECA4
55m
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

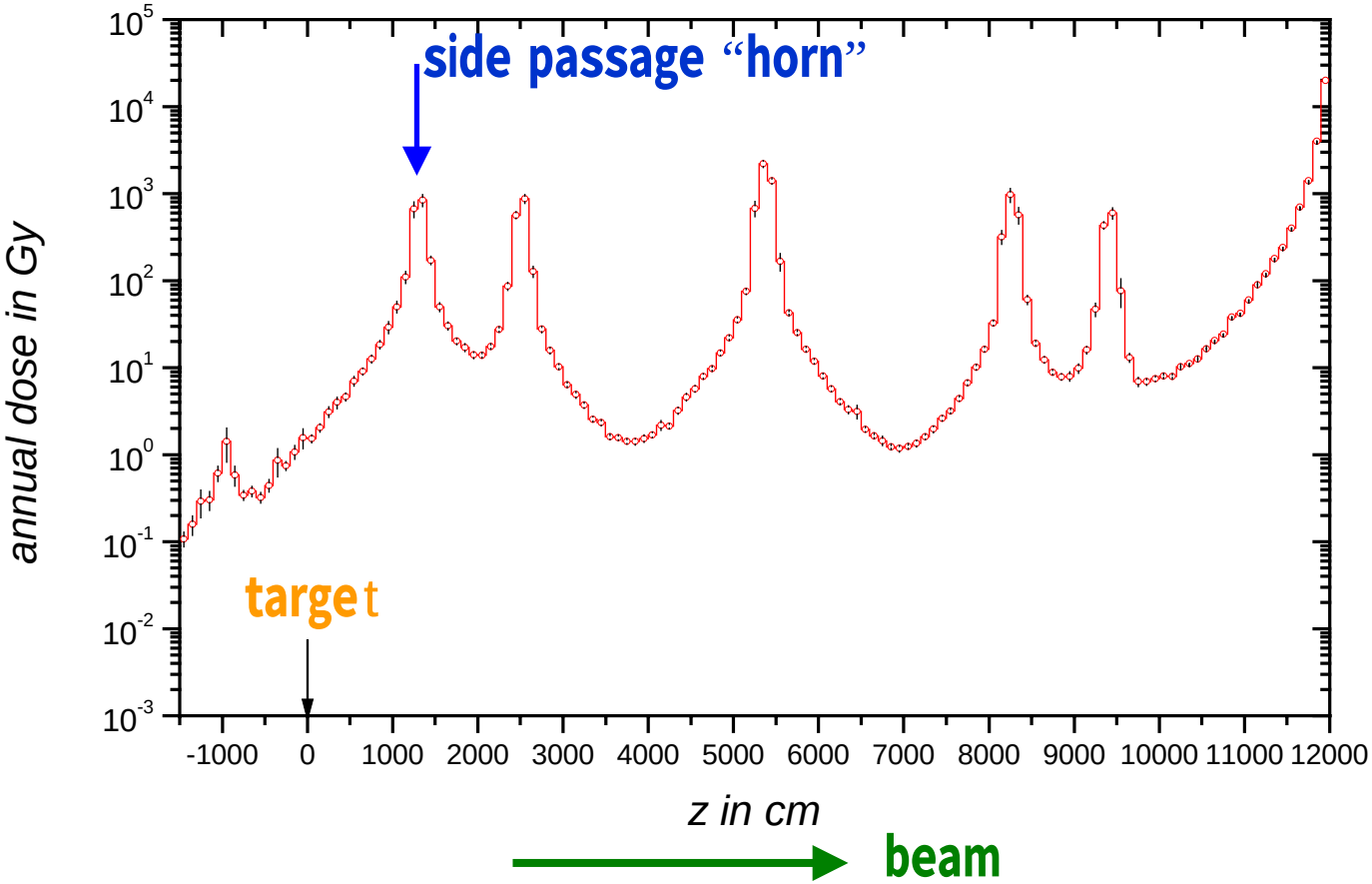
Proton beam tunnel – Feb. 2002

Proton beam tunnel – April 2003


Service Gallery
transformer
pump
Air cooling unit (rese
FD
Horn Strip-lines
strip-line
13000
12000
Horn Water tank
(Capacity 500 l.)
TSG43
TSG44
SD/S
SD/S
Trench (4x)
(7000x1200, depth 900)
Target Chamber
Horn
Helium tank

Absorbed does in concrete walls of service gallery

(based on 13.8 × 10^{19} pot/y)



3b. Infrastructure

Hadron stop + muon detector access galleries:
(access via LHC – TI8)

going towards completion (Jan. 2004)

shot-crete
10% slope

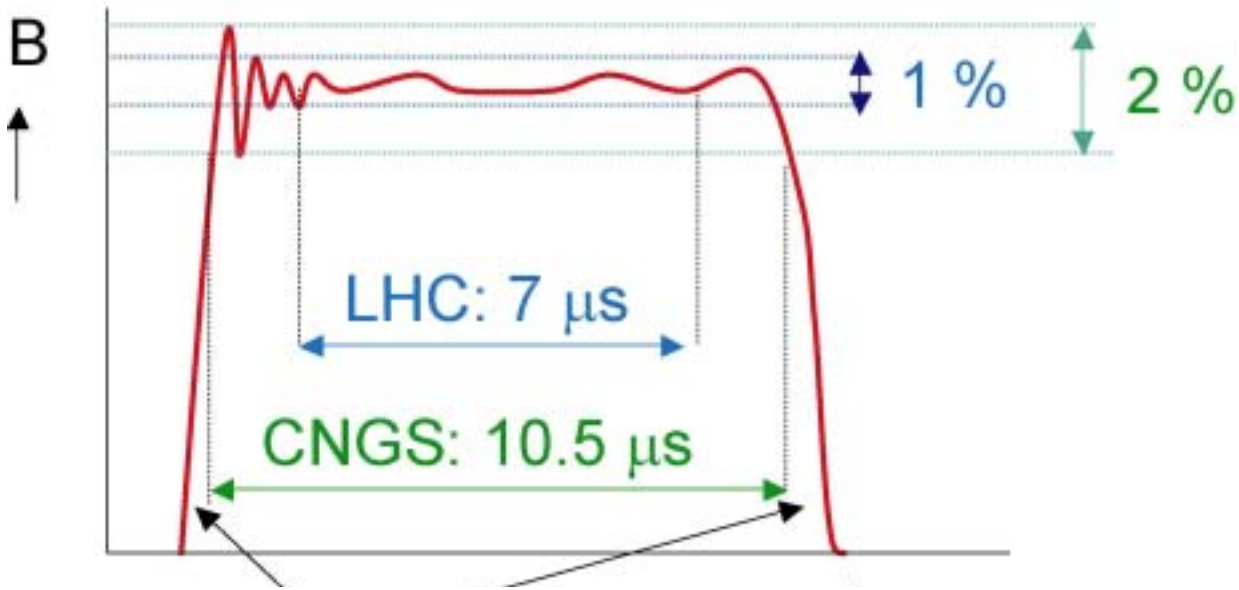
3c. Equipment

Extraction from SPS + TT40 (common with LHC):

concept tested successfully with beam;
pulse shape for CNGS double pulse to be done

SPS: 23 μs

Extraction from SPS –
Timing foreseen for 10.5 μs CNGS pulse:



CNGS needs: fast rise and fall time,
2% ripple over the full length of flat top

(**Note:** two such pulses are needed, 50 ms apart)

extracted beam
(8 Oct. 2003)
σ_x = 1 mm, σ_y=0.6 mm

3c. Equipment

Proton beam (cf. M. Meddahi + R. Jones):

- magnets from Novosibirsk are arriving at a regular rythm
  (37 bends arrived, 1st quad arrived ;
  corrector magnet design is finished)

- vacuum system design complete (except window -> L. Bruno)

- beam monitoring equipment under construction
  (except target monitor -> R. Jones)

3c. Equipment (cont.)

Target station (cf. L. Bruno):

design progressing, shielding design approaching completion,
target unit prototype under construction

Horn/Reflector (cf. S. Rangod, S .Wallon, G. Maire)

under construction (horn inner conductors: finished, under test)
water cooling circuit in design phase

electrical system: new capacitors ordered

3d. Decay Tube + Windows

(cf. A. Pardons):

- first decay tube sleeves have arrived at CERN
  long, difficult job to build the 1 km tube;

  (contractor has reserved a lot of time for vacuum testing...)

3d. Decay Tube + Windows (cont.)

(cf. A. Pardons):

- exit window is already in the hadron stop chamber (ready)
- entrance window: exists, needs to be mounted

- vacuum pumps: ordered

exit flange
“in the box”

3e. Hadron Stop (beam dump)

(cf. A. Pardons):

finished (except water cooling connections)

1 July 2003

4. Summary

CNGS civil works are completed (phase I),
hadron stop installed

--> CNGS is "on schedule" for May 2006

Next major step on the site:

--> installation of decay tube,
then finalize civil works –> Aug. '04

Main problem: m & m

Our worries: welding decay tube, windows, beam stability,
target rods, target monitor,
shielding + radioactive handling,...
(cf. the other CNGS talks)

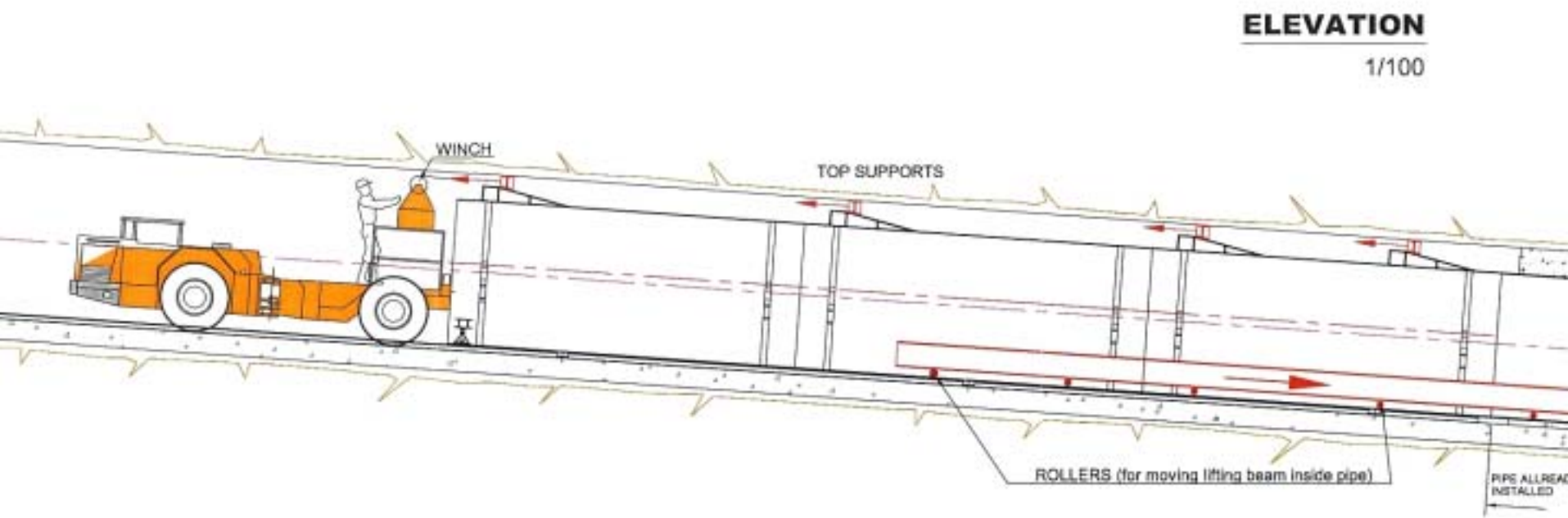

CERN
C
N
G
S

V = 1 litre air-filled ionisation chambers
(17 fixed + 1 moveable detector
in both muon detection chambers)

CNGS: effects of alignment errors

– study the needs of remotely controlled movements

Examples:	effect on ν_τ cc events
horn off axis by 6 mm	< 3%
reflector off axis by 30 mm	3%
proton beam on target off axis by 1 mm	< 3%
CNGS facility misaligned by 0.5 mrad (beam 360 m off)	< 3%


ELEVATION
1/100
WINCH
TOP SUPPORTS
ROLLERS (for moving lifting beam inside pipe)
PIPE ALLREAD
INSTALLED

3b. Infrastructure

other areas of CNGS:

- crane in target chamber: contract adjudicated
- ventilation: bids opened
- water cooling systems: call for tender
- electrical systems: in progress (using existing contracts)