



Status of the CNGS Project

- > Project Overview
- > Progress of works (cf. last AB seminar Feb. 2004)
- > Outlook: the coming months
- > Commissioning
- > Summary



MERCI!

- contractors' personnel
- FSU in the different teams
- CERN staff from all departments





many thanks !

- and my sincerest *APOLOGIES* ...

... for not being able to show all that has been achieved since February 2004 !

... for not mentioning any names !

Project Overview

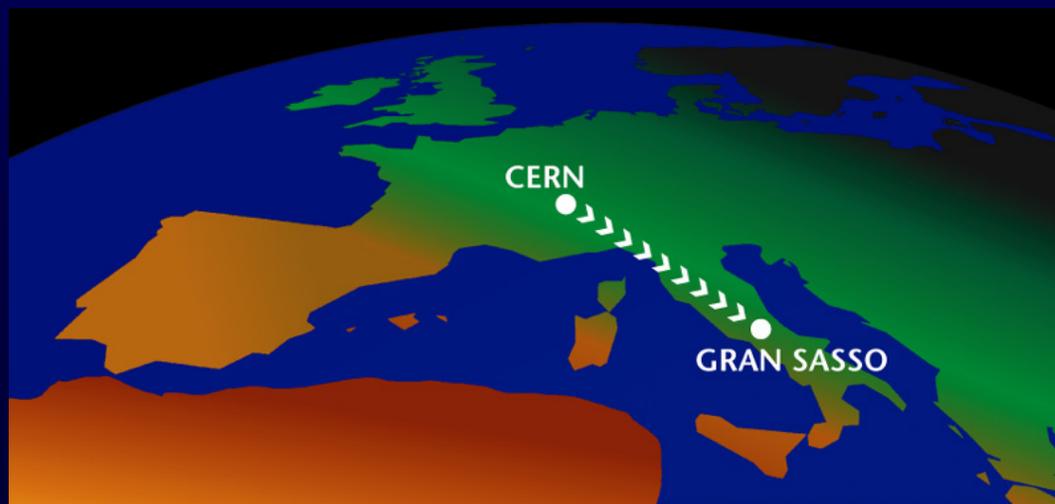
(see <http://cern.ch/cngs>)

CNGS - a long base-line neutrino beam facility (732 km)

send ν_{μ} beam \rightarrow detect ν_{τ} appearance

CNGS project at CERN: production of an intense ν_{μ} beam

using protons from the existing accelerator chain

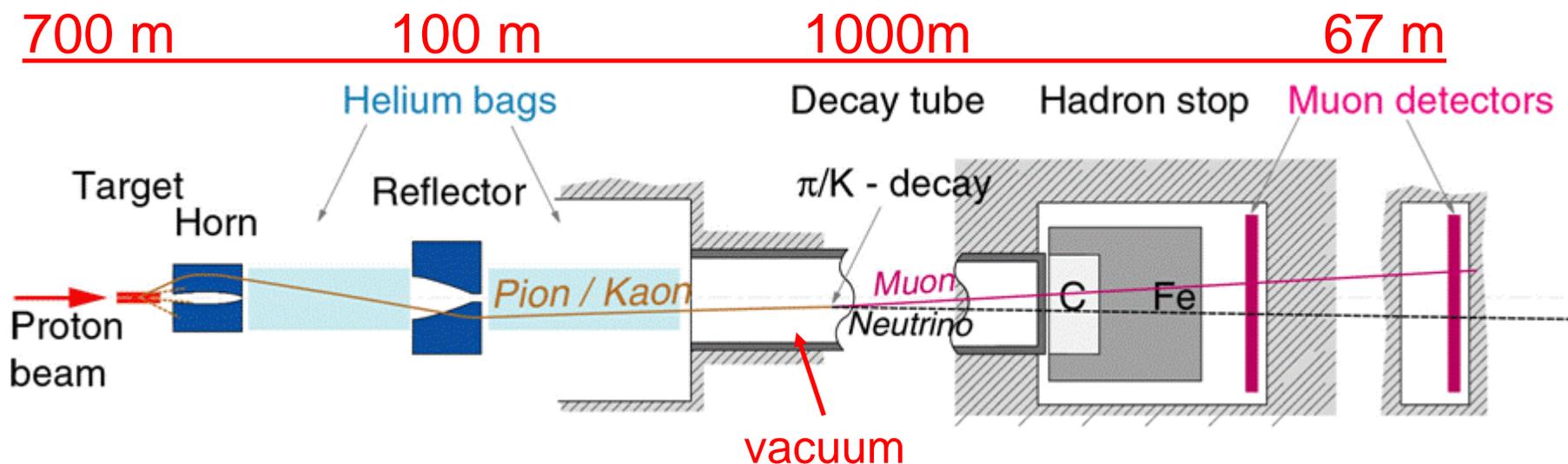


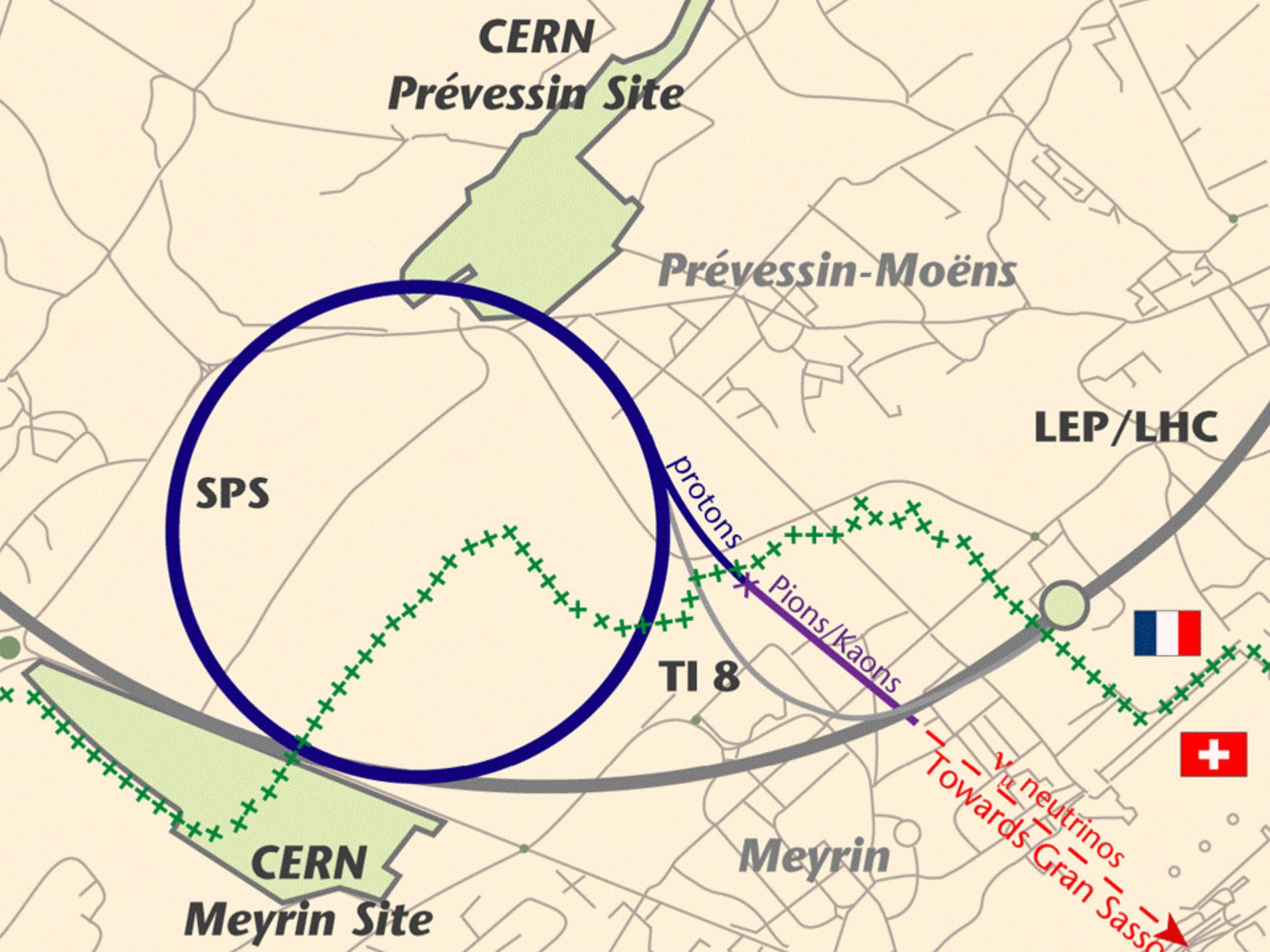
at Gran Sasso:

Experiment(s)
detecting ν_{τ}

CNGS: main components

(of a classical accelerator neutrino beam)





CERN
Préveessin Site

Préveessin-Moëns

LEP/LHC

SPS

TI 8

protons

Pions/Kaons

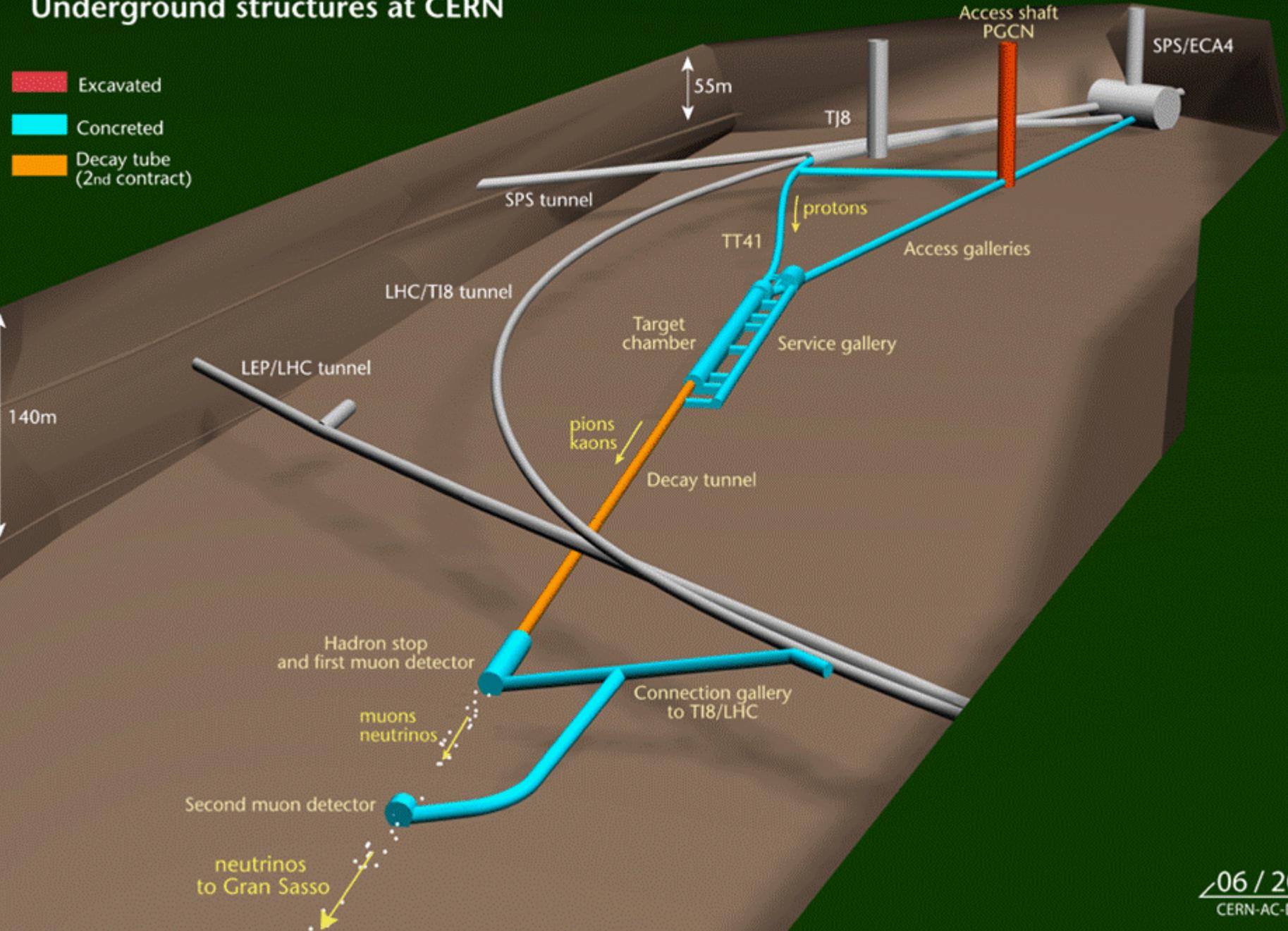
CERN
Meyrin Site

Meyrin

Towards neutrinos
Gran Sasso

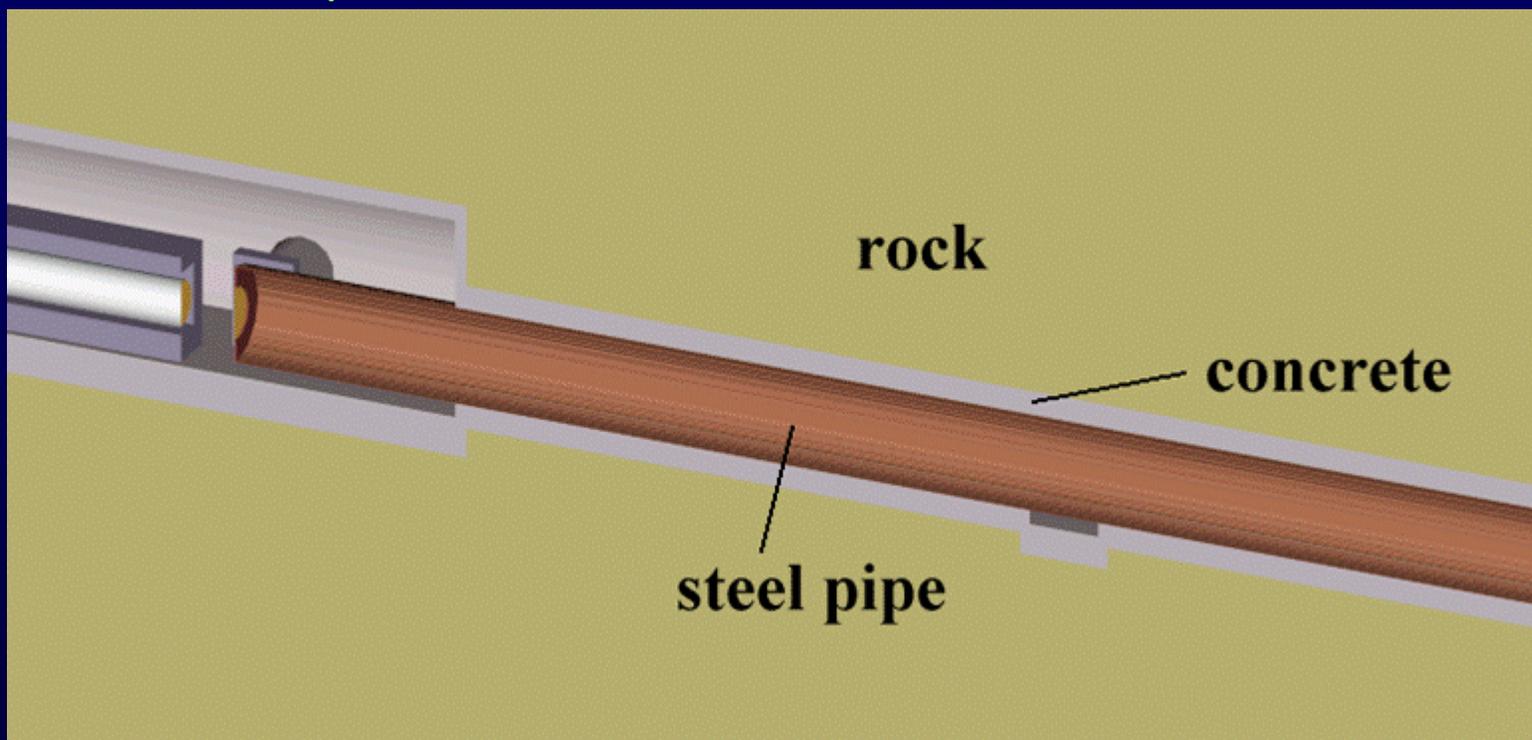
CERN NEUTRINOS TO GRAN SASSO

Underground structures at CERN



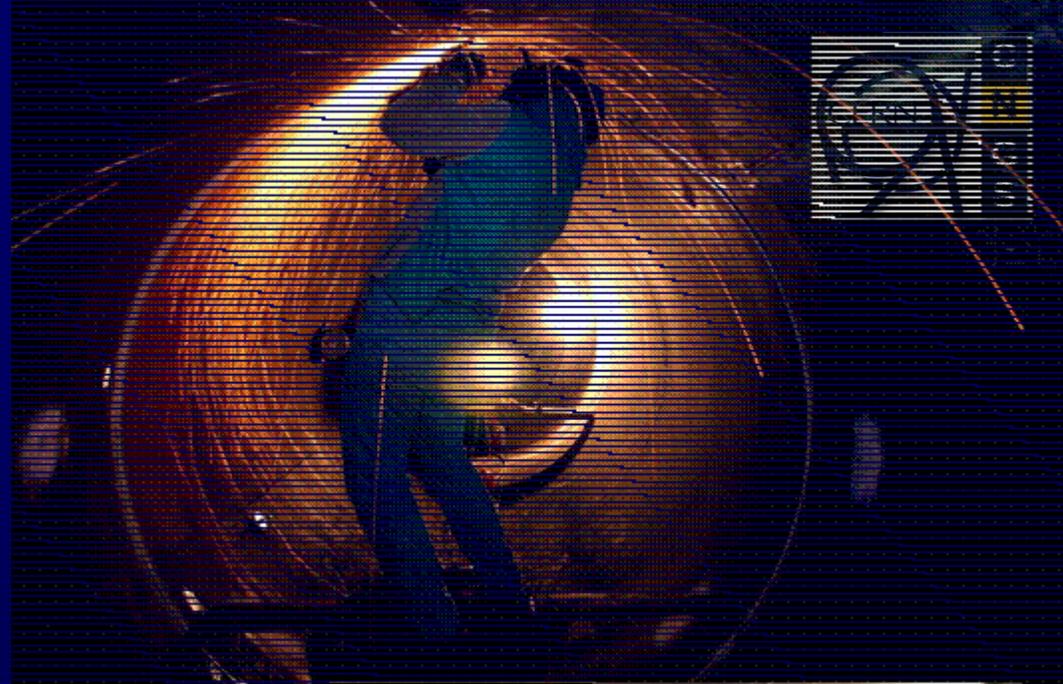
Progress of works

CNGS Decay tube



998 m long, evacuated 1-2 Torr
 2.45 m diameter
 18 mm thick

Half way!
(Feb 2004)



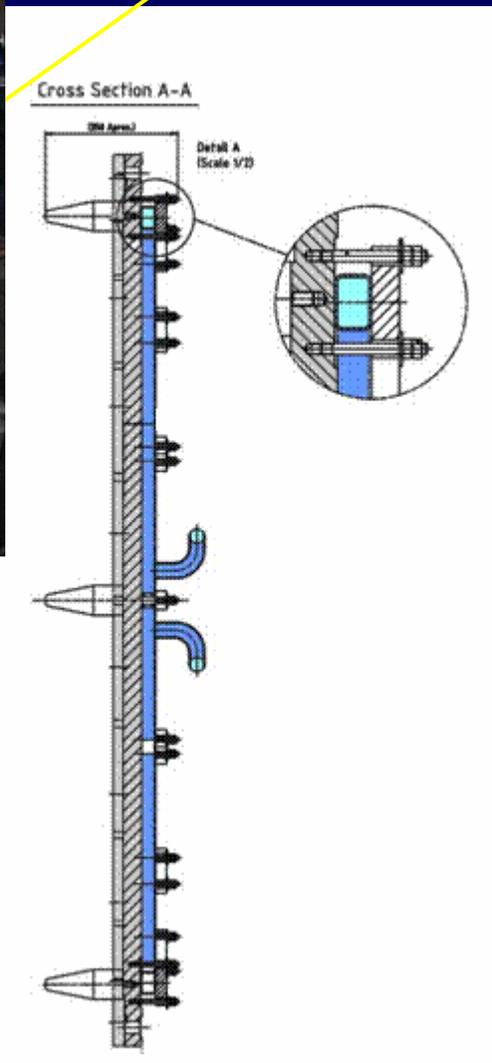
**Last sleeve in
target cavern**
(Mar 2004)



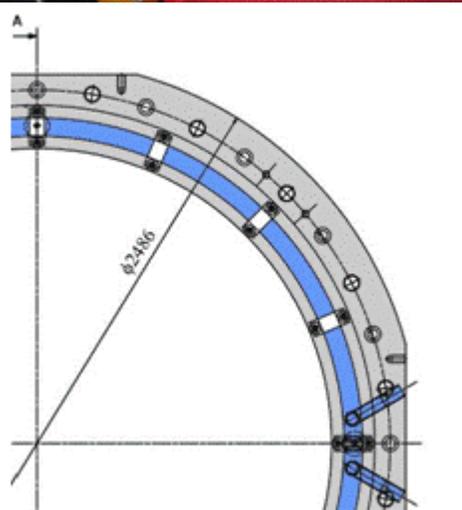


exit window

50mm
steel



provis. entrance window



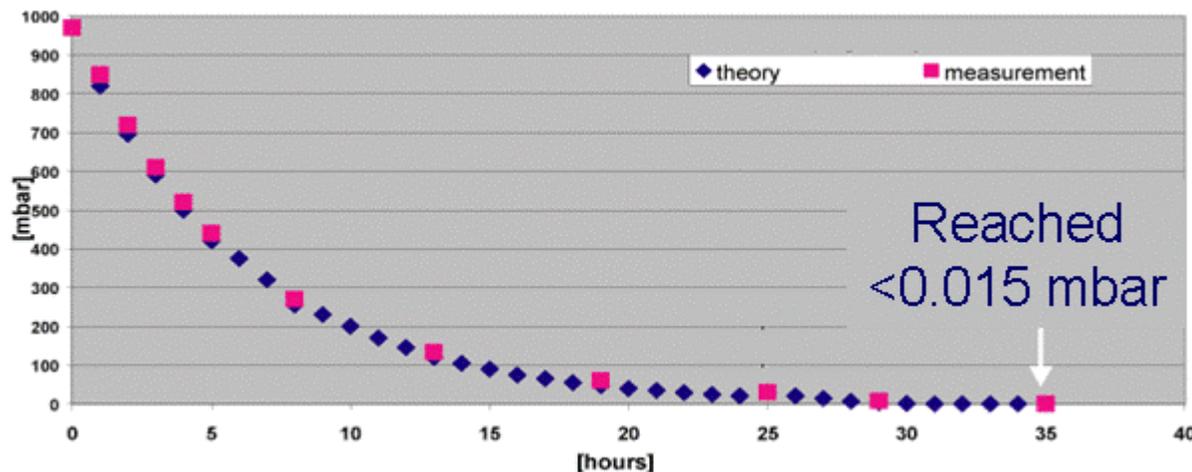


Quality control of a total of 3.6 km of welds

<u>Quality control of the welds in the workshop(s)</u>		<u>detected fault rate</u>
-Visual examination	100%	
-Ultrasonic examination	85%	1.8%
-Dye penetrant testing	100%	0.5%
-Radiographic examination of all welding joints non controlled by ultrasonic examination	15%	2.9%
<u>Quality control of the welds in the Decay tunnel</u>		
-Visual examination	100%	
-Ultrasonic examination	100%	0.4%
-Dye penetrant testing	100%	0.7%

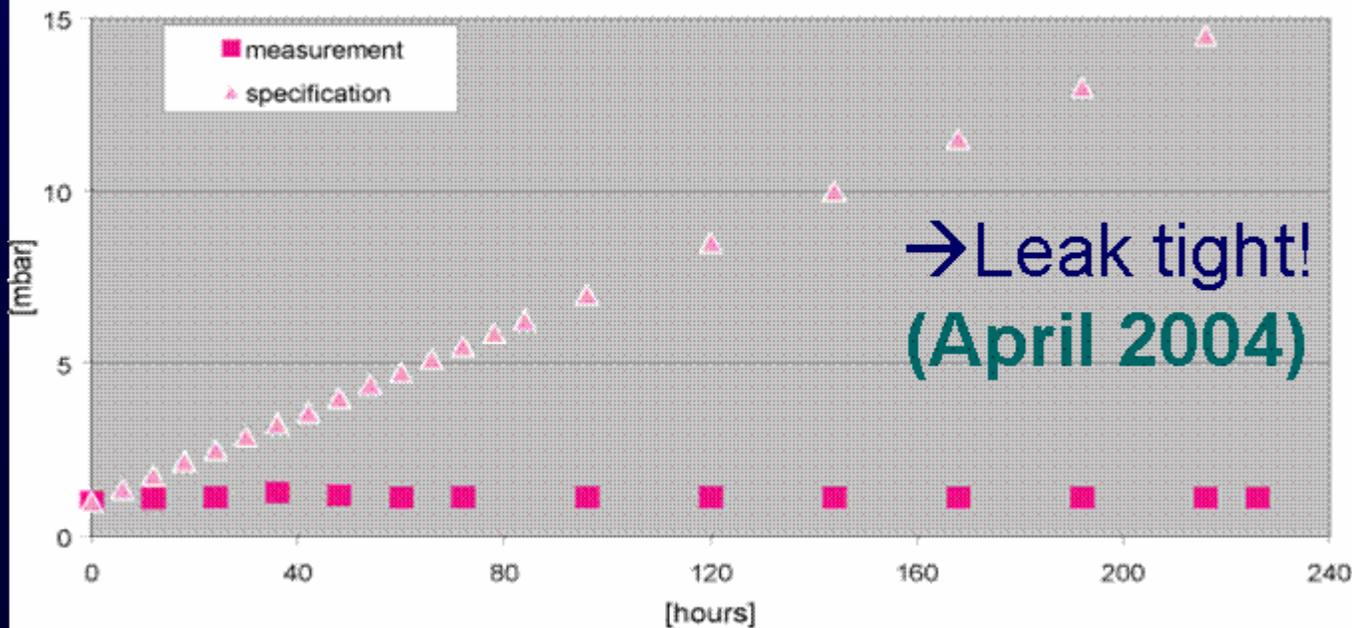


Decay Tube Vacuum



↓
Valves closed,
Pumps stopped,
10 days
...patience

Decay tube: pressure increase vs. time



Civil Engineering



24 June 2003



21 July 2005

CNGS station
AB seminar



21 July 2005



30 June 2004 - end of civil engineering

September 2004

21 July 2005

CNGS status report
AB seminar by K. Elsener



21 July 2005

CNGS status report
AB seminar by K. Elsener



Infrastructure / General Services

... what you need to « make it all work »...

- water cooling / demin. water
- ventilation / air-conditioning
- electricity / lights / safety equipment / GSM
- overhead crane
- power-feed rail
- ...



Proton beam tunnel



Proton beam tunnel



Proton beam tunnel



Proton beam tunnel



Proton beam tunnel - 1 July 2005



Access Gallery



Access Gallery



Access Gallery



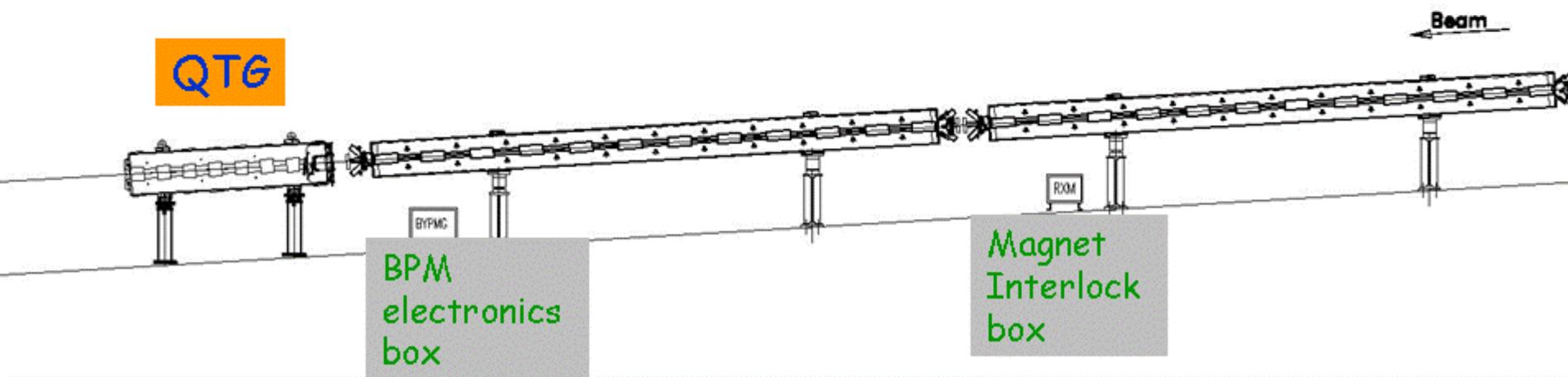
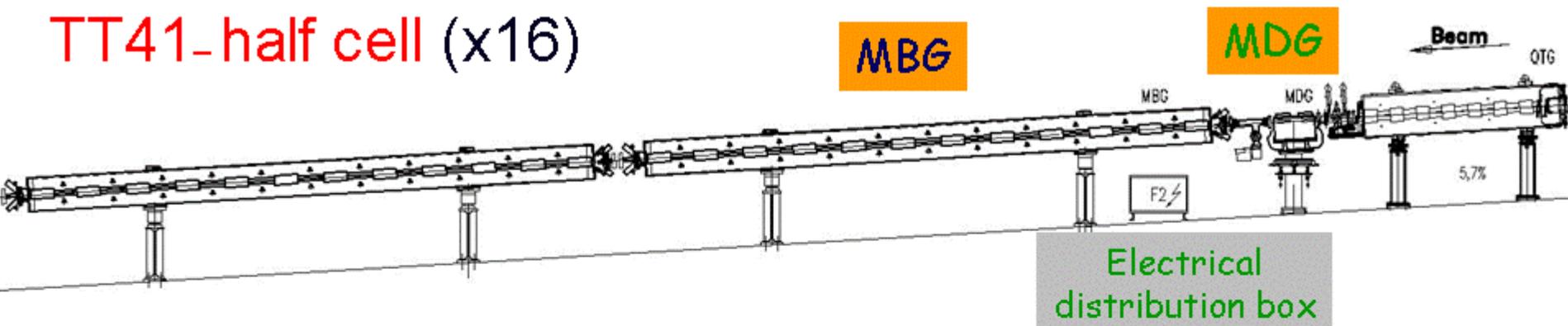
Access Gallery



Access Gallery

Proton beamline

TT41-half cell (x16)



MBG magnets - all 78 received, currently stored



QTG quadrupoles - all 24 received

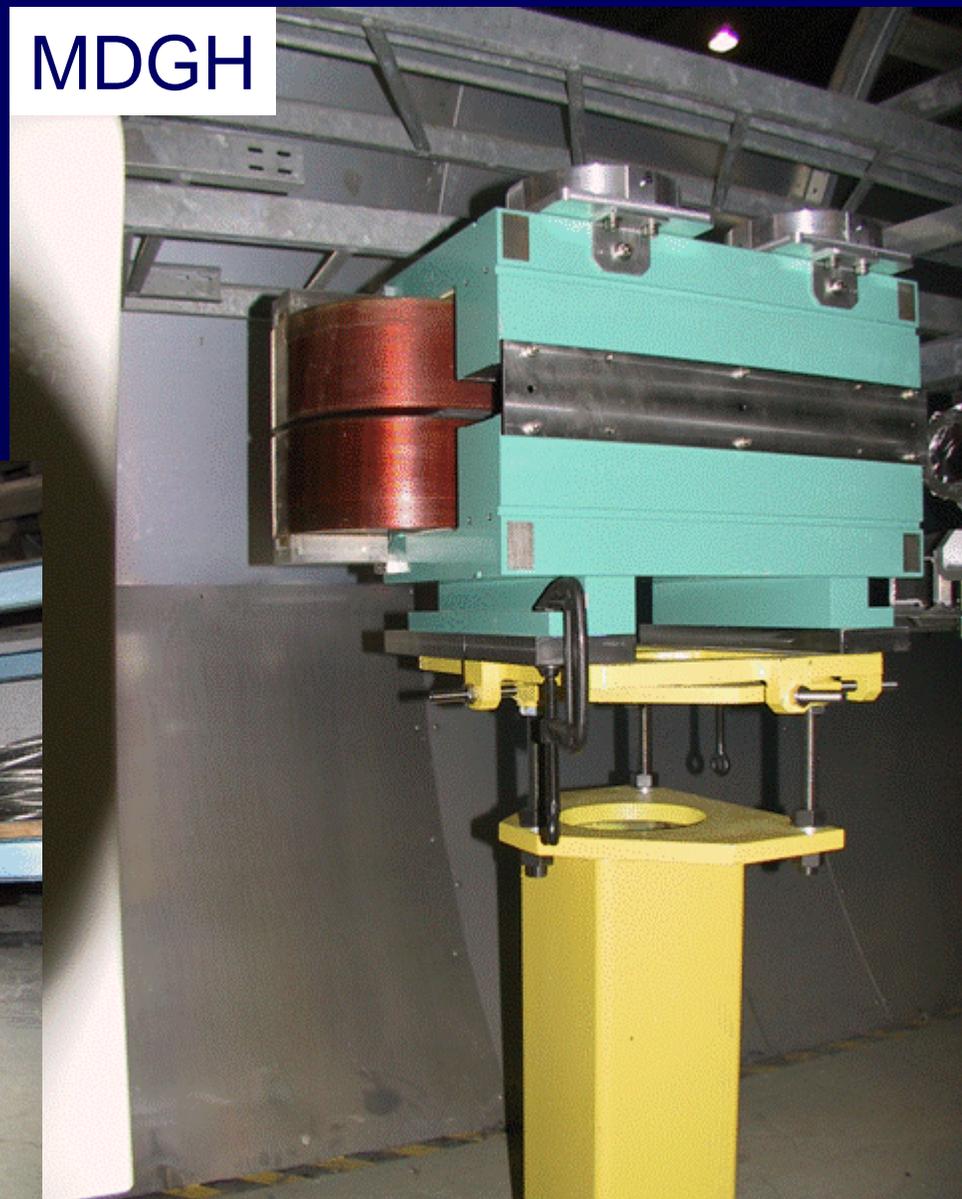


QTG quadrupoles - 20 July 2005: last QTG installed



MDG correctors - 4 out of 17 missing, delivery end July 2005

MDGH



MDGV

Powering of magnets

BB4

TT41



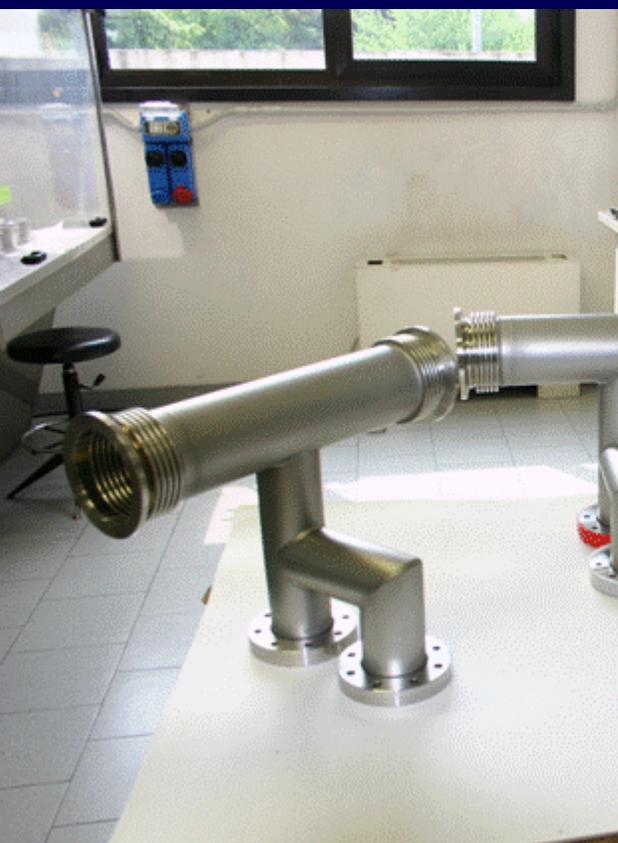
Could we have an MB
power electronic switch
TI8 \leftrightarrow TT41
for May 2006 ?

Vacuum components (parts recuperated from LEP !)

+
delivery 1st week Sept. 2005
installation to start mid-Oct. 2005

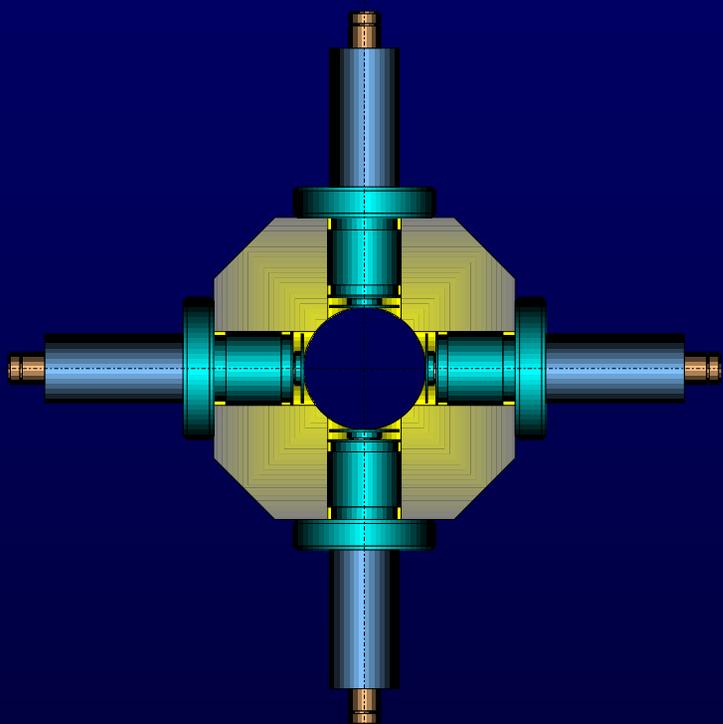


pre-series vacuum components



BPG beam position monitors - mounted on QTGs

[Electronics: work in progress]



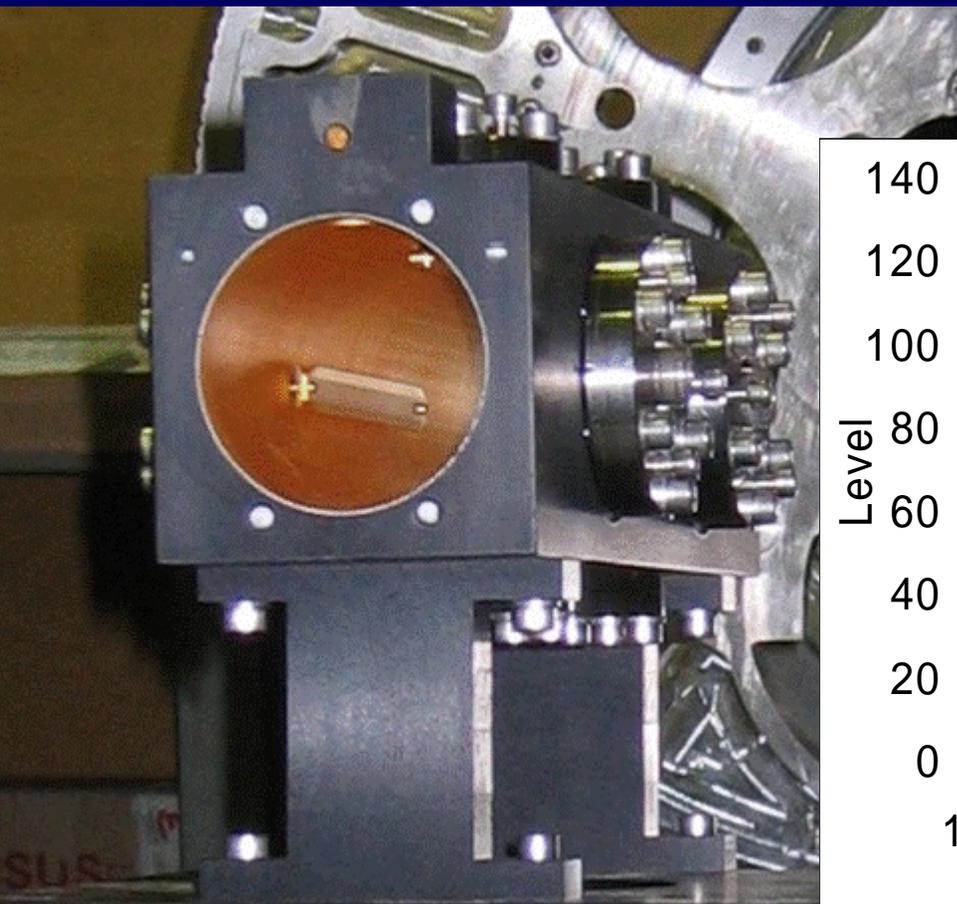
18 Button Electrode
BPMs in TT41
60mm Aperture

21 July 2005

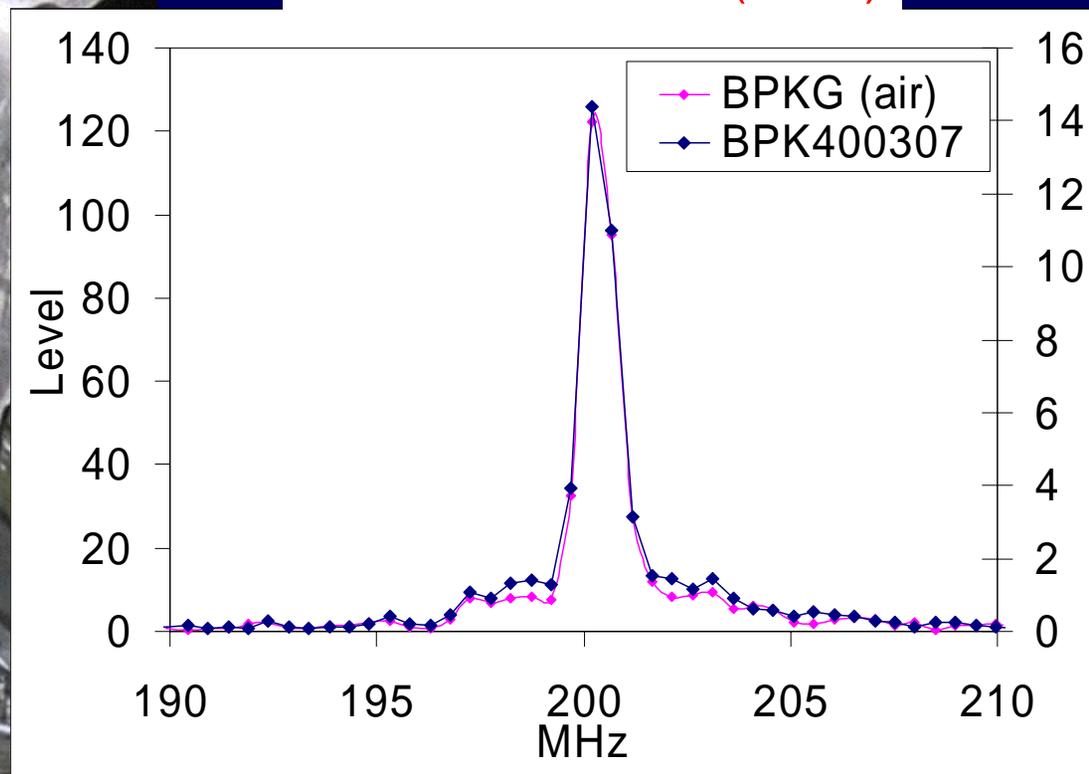


BPKG - special beam position monitor on target table

Stripline Coupler Pick-up operated in air



Test results TT40 (2004)



BTVG beam profile monitors

(choice of 75 μm carbon and 12 μm titanium screen)



Ti screen "in"



... reminder ...

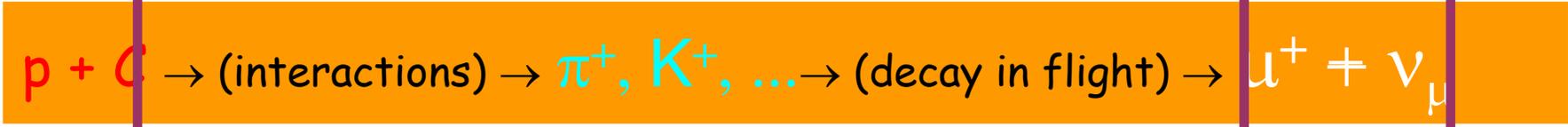
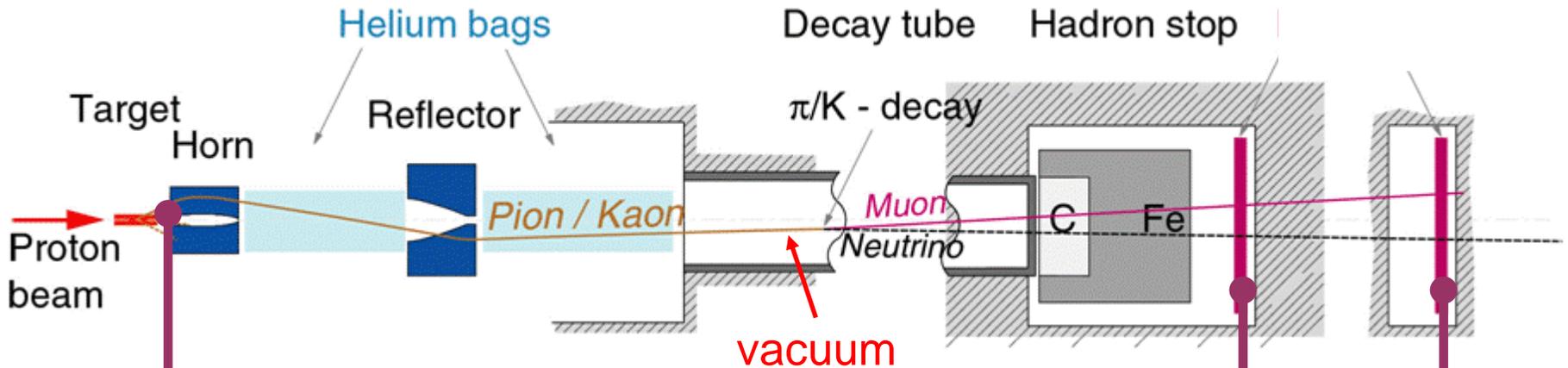


700 m

100 m

1000m

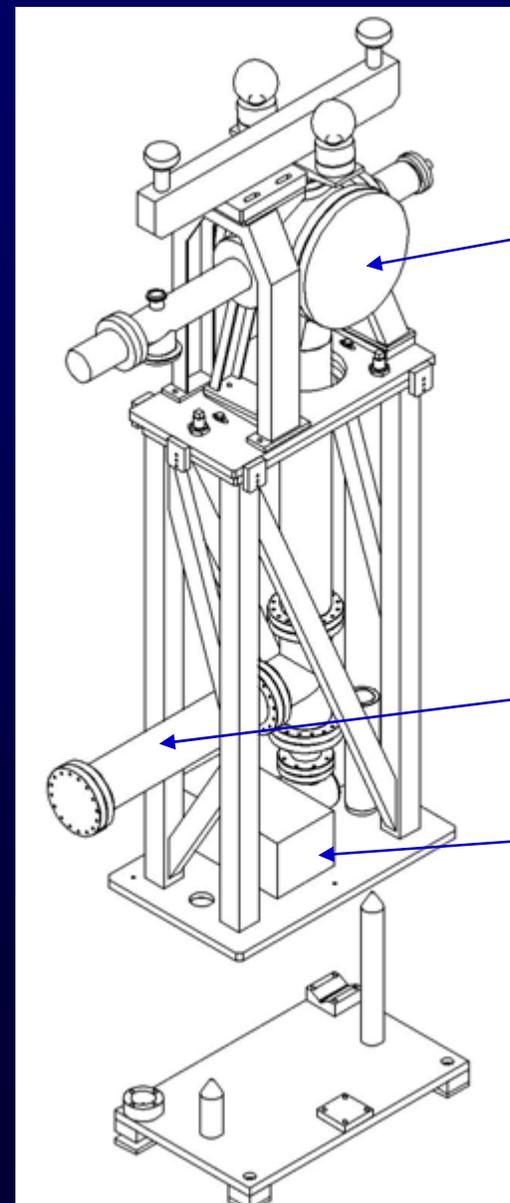
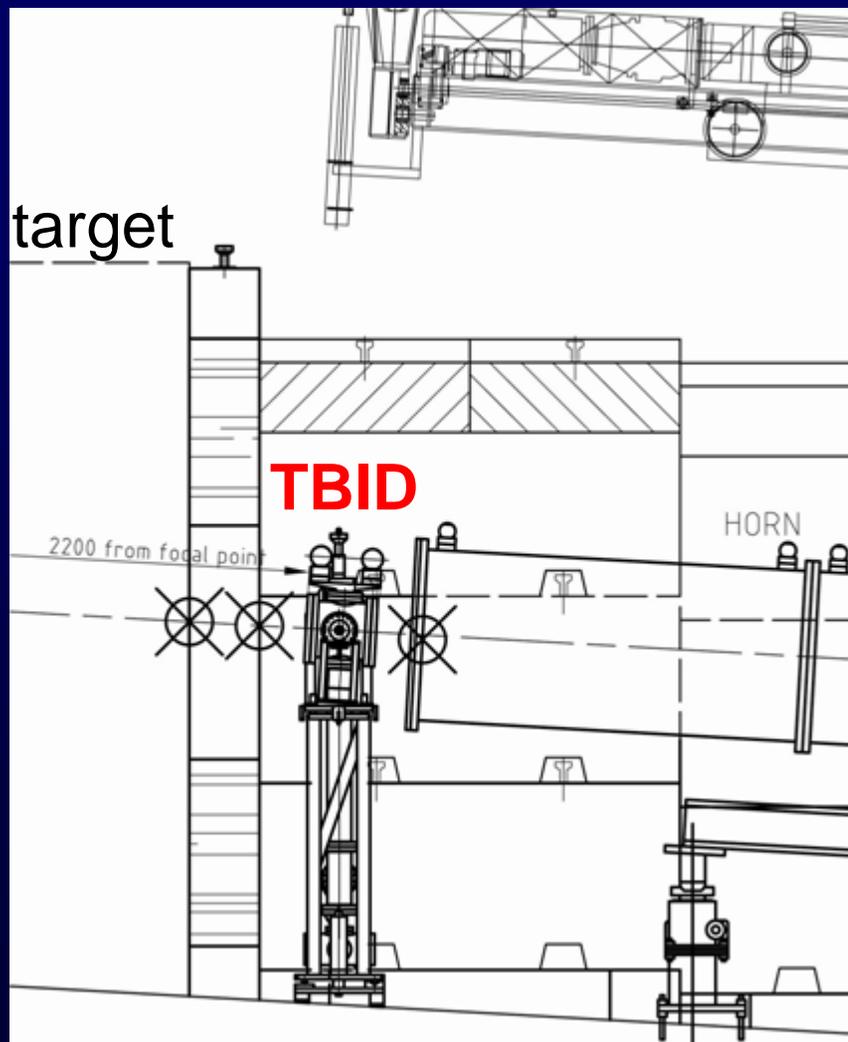
67 m



TBID monitor

muon monitors

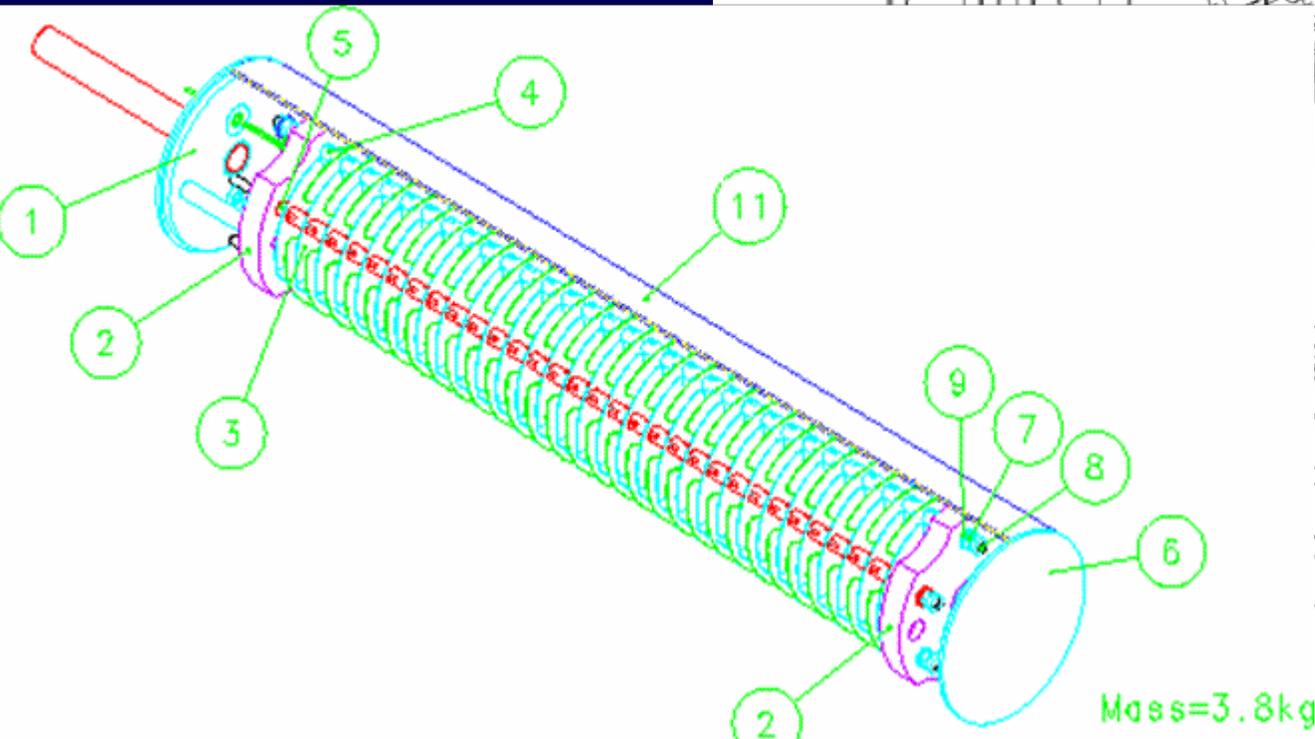
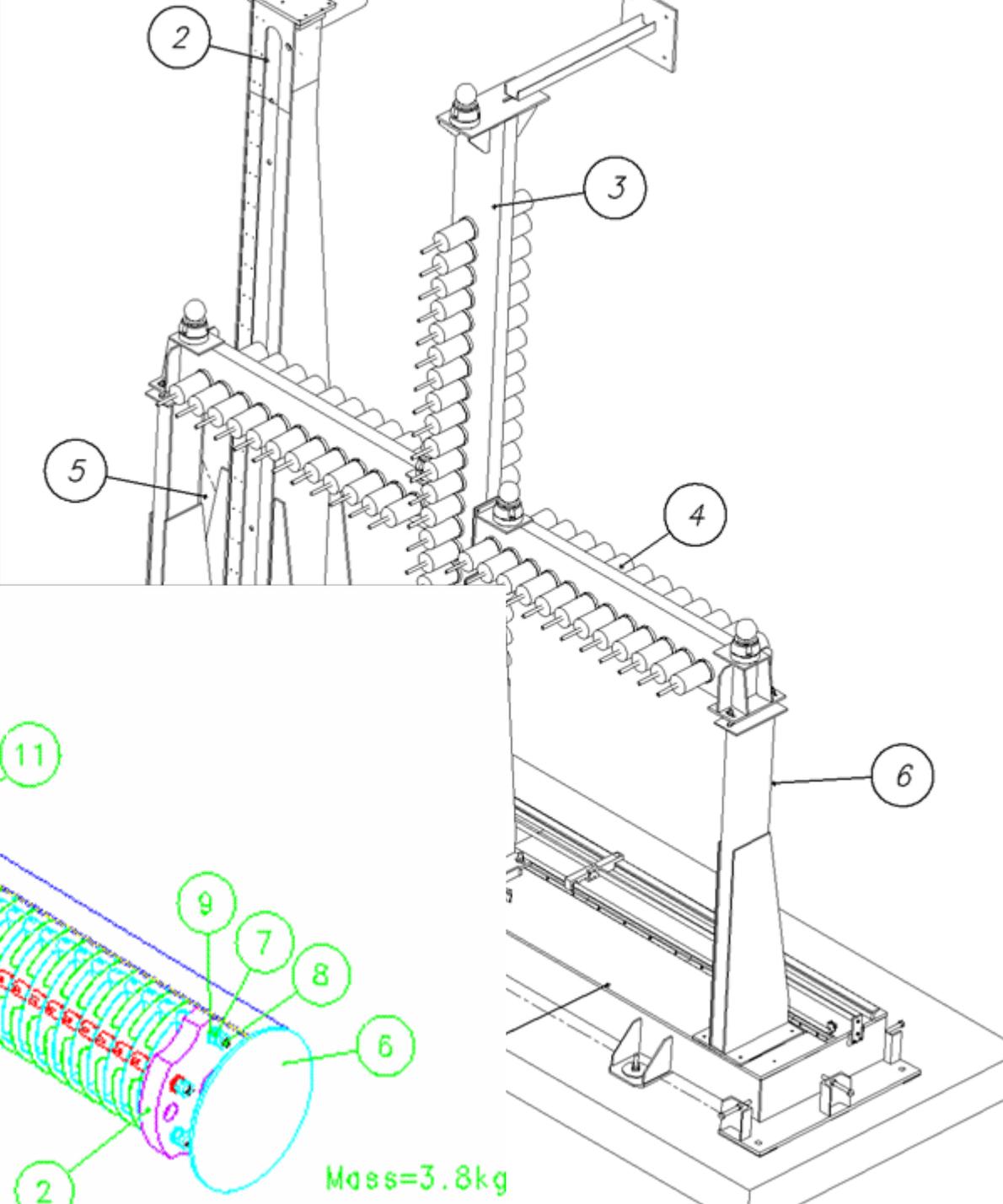
TBID - target downstream monitor



Muon Monitors

Mechanics / frames
under construction
-- end Sept. 2005

Beam Loss Monitors
(LHC type)
baseline: 2 x 18 monitors





Controls / Timing / Interlocks

- work has started / responsibilities are clarified
- hoping to profit enormously from TI8 experience
- but ... many CNGS-specific items ... (horn, muon m., ...)
- >-> much work needs to be done

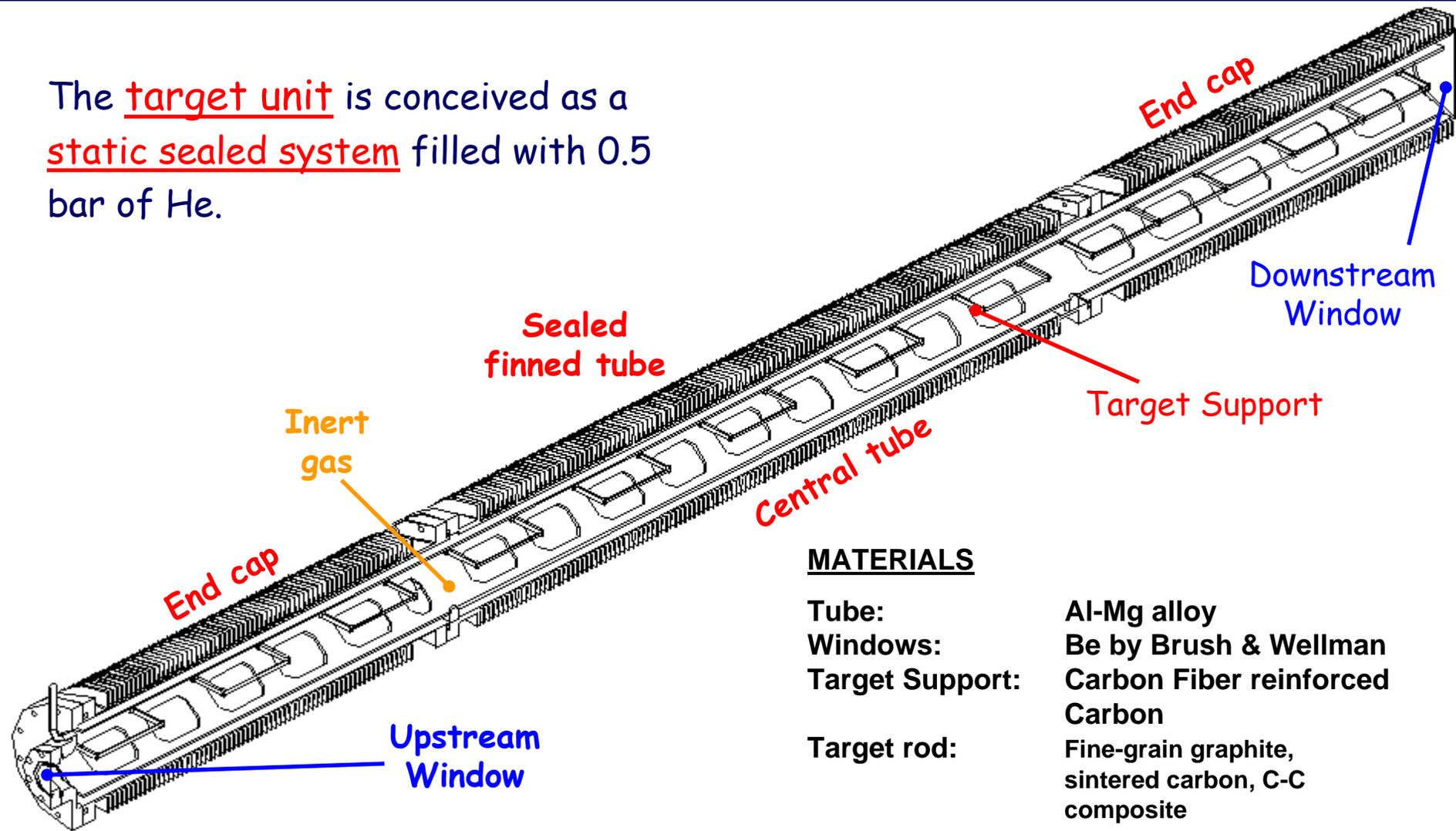
We are confident that the necessary effort will be made and that all will be working well in May 2006



Target

"Graphite rods", $L = 10 \text{ cm}$, $\Phi = 5 / 4 \text{ mm}$

The target unit is conceived as a static sealed system filled with 0.5 bar of He.



MATERIALS

- | | |
|-----------------|---|
| Tube: | Al-Mg alloy |
| Windows: | Be by Brush & Wellman |
| Target Support: | Carbon Fiber reinforced Carbon |
| Target rod: | Fine-grain graphite, sintered carbon, C-C composite |

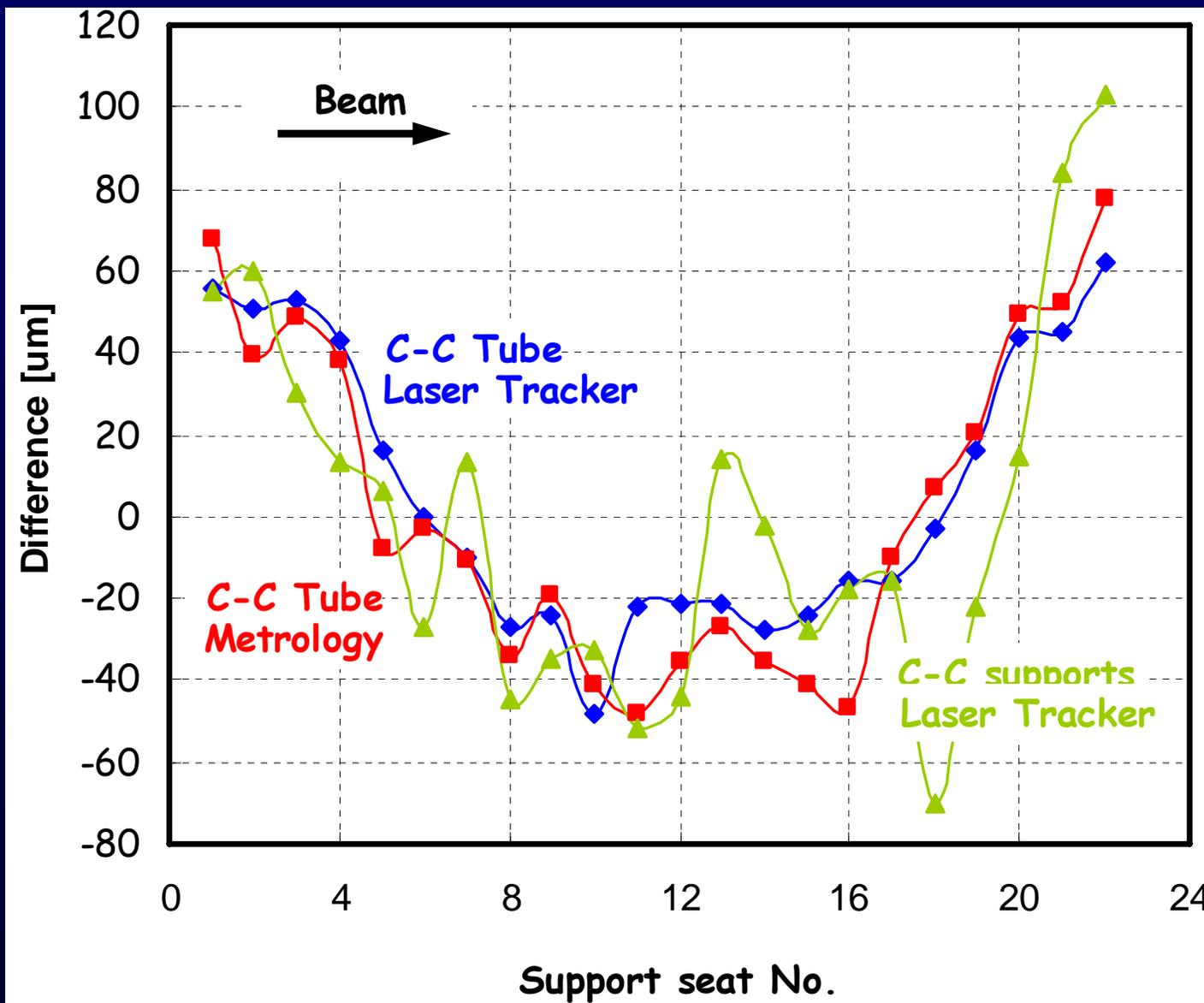
The target units







Target rods: alignment

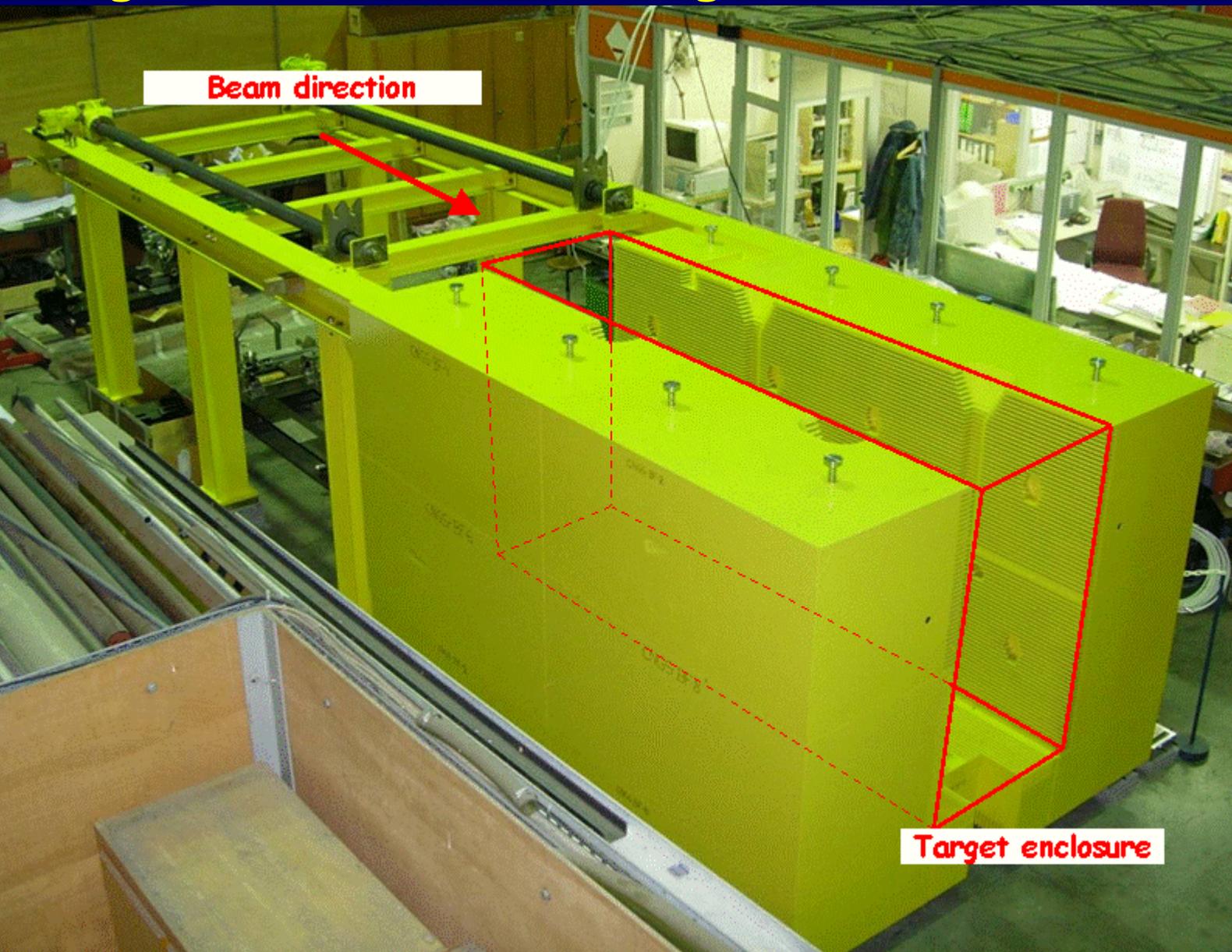


Target Magazine + BPKG



Indexing finger

Target Station - Shielding



Beam direction

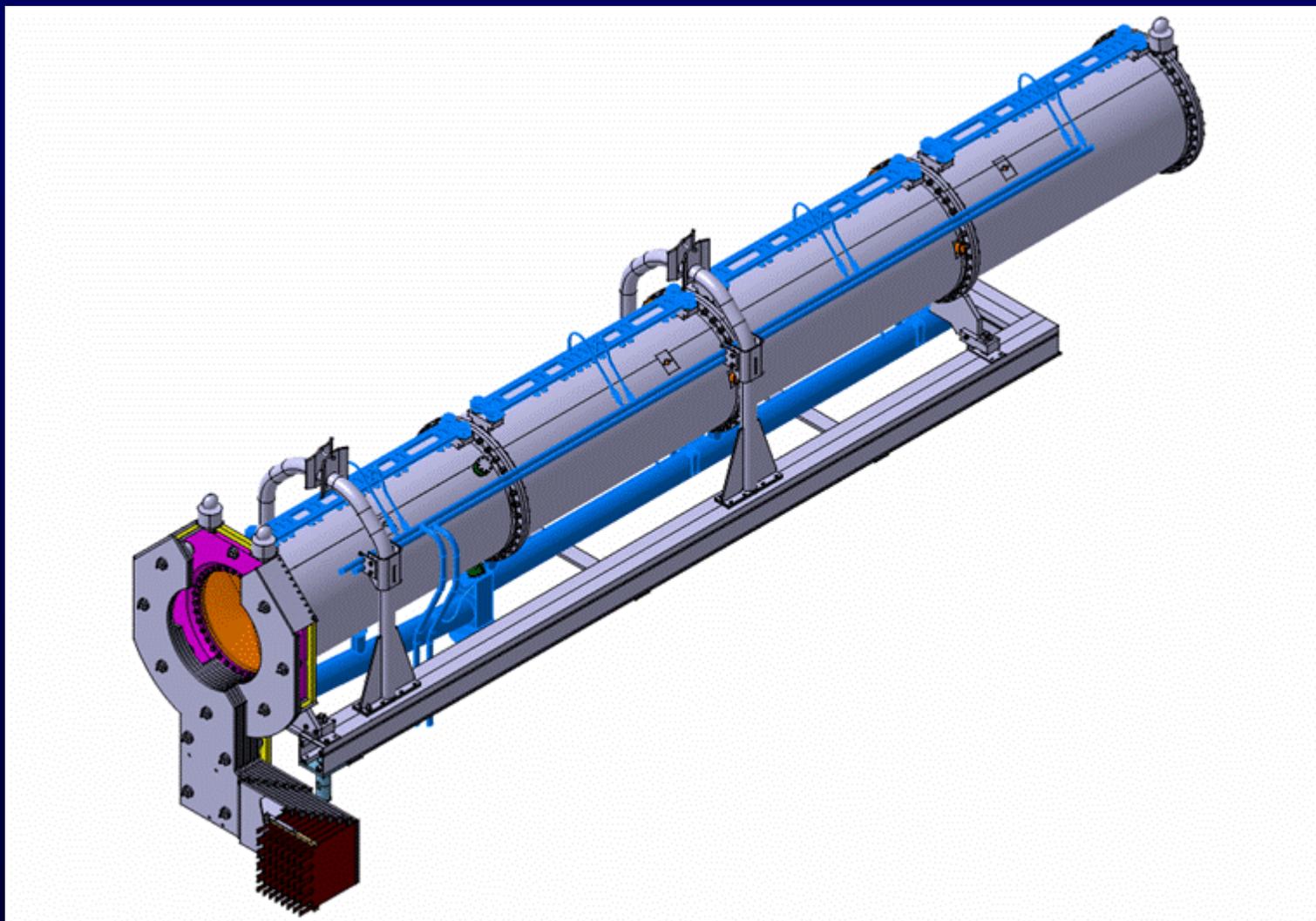
Target enclosure

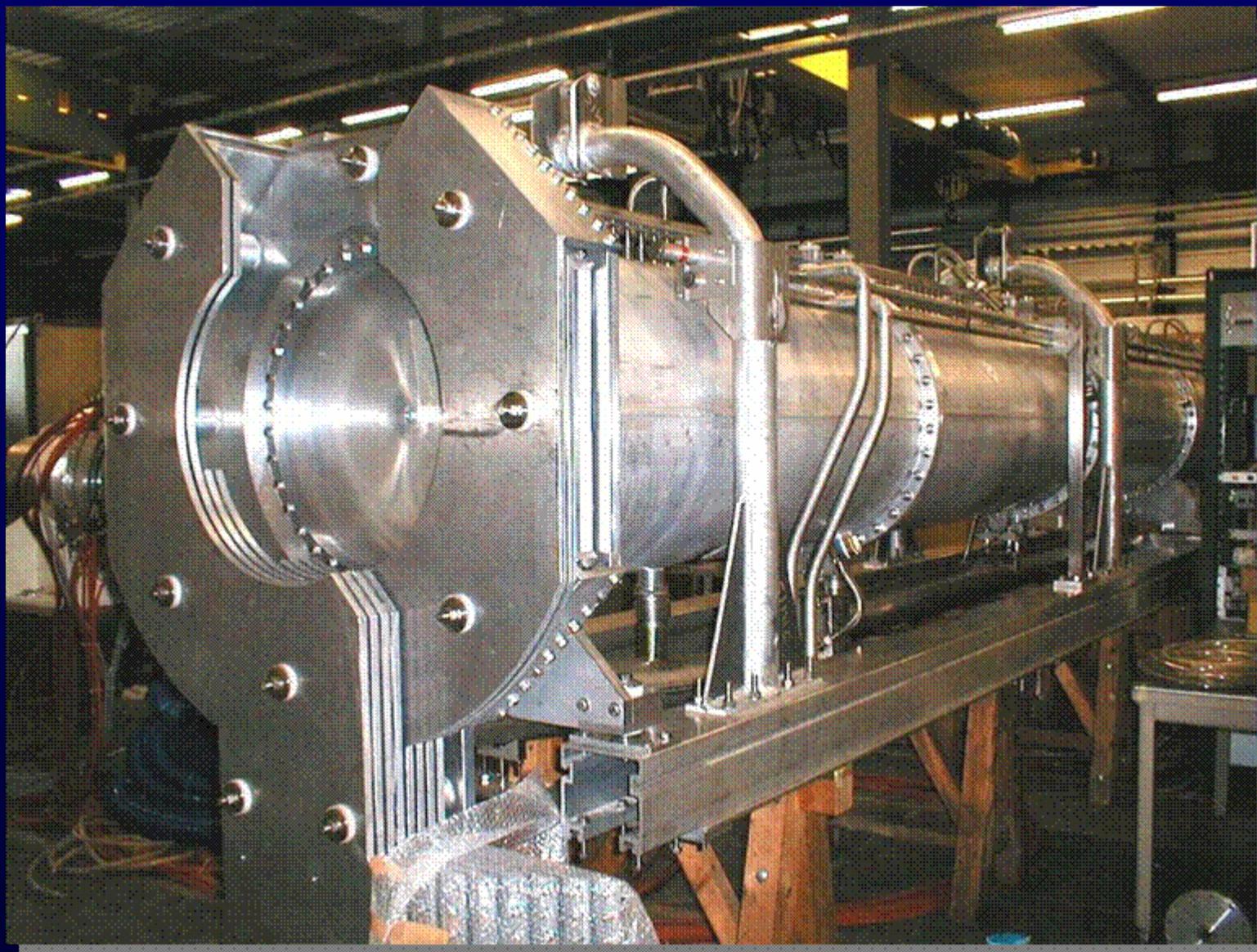
The CNGS Target Team

Not present for the photo: J-F.Arbogast, R.Bonthond, P.Bourquin, R.Hanni, A. Lavenu, G.Patti, P.Sievers, J.K.Wickstrom



Horn, Reflector + Accessories





21 July 2005

CNGS status report
AB seminar by K. Elsener

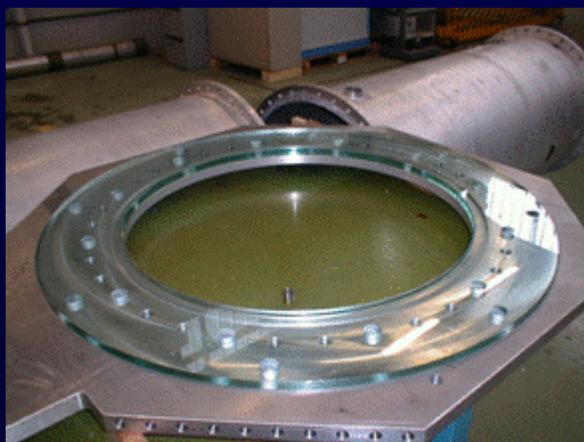
Glass Disk - the remaining **BIG** issue

Received from LAL



Glass plate broken
Problem = conceptual

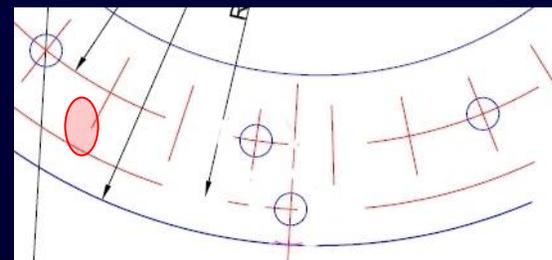
After modification



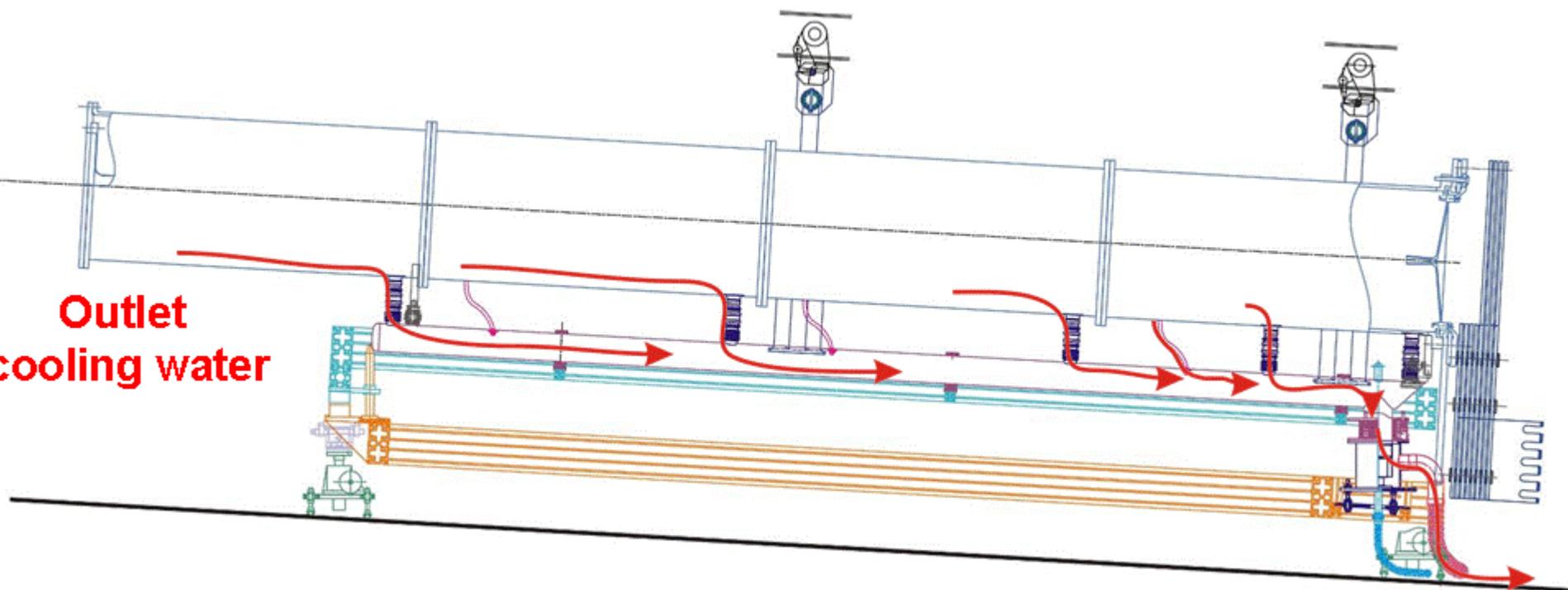
21 July 2005



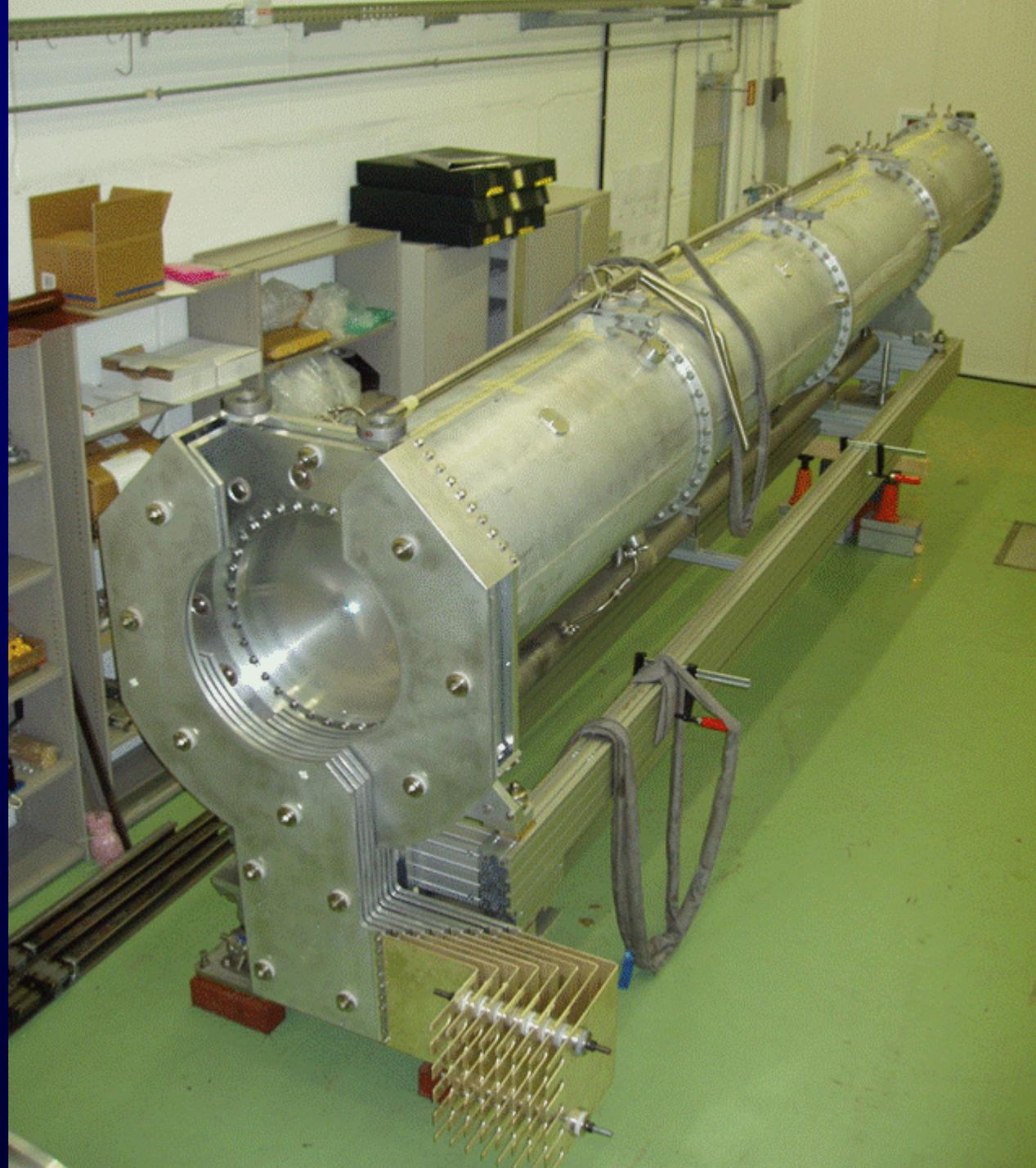
Cracks discovered ~weeks
after electrical tests



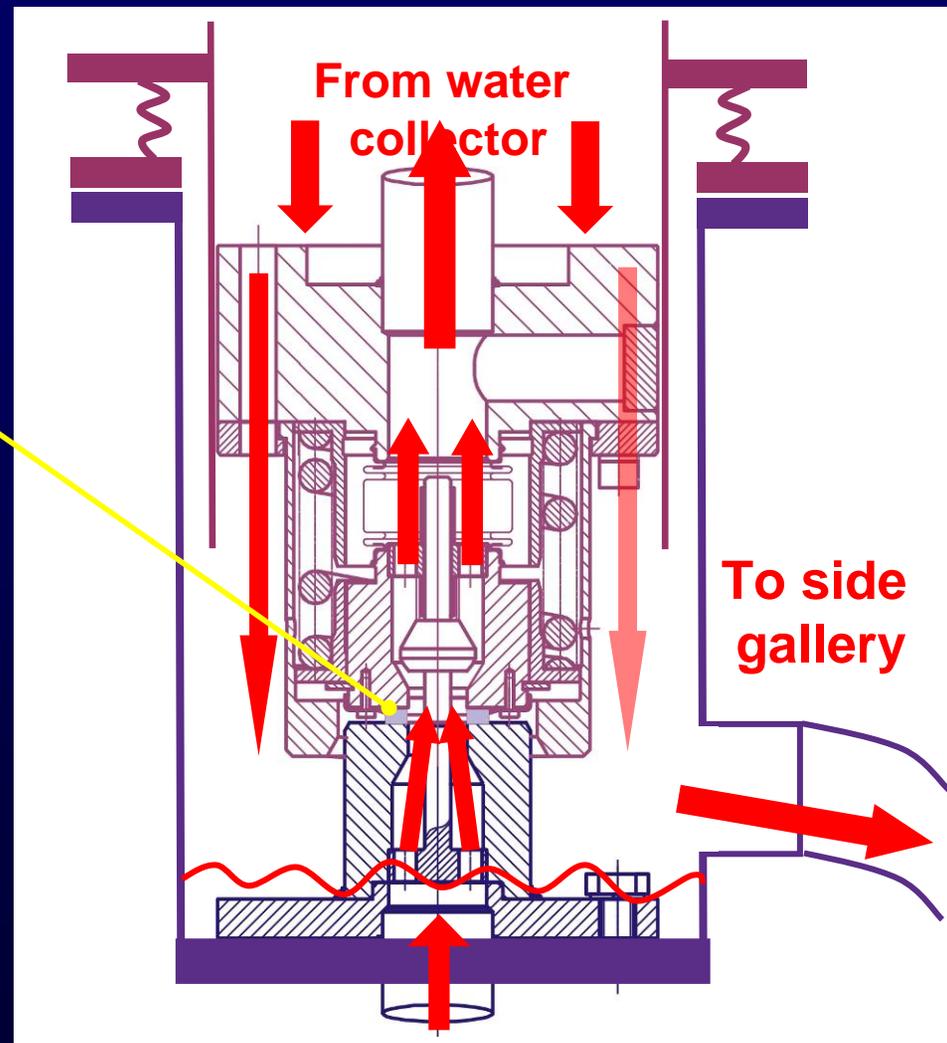
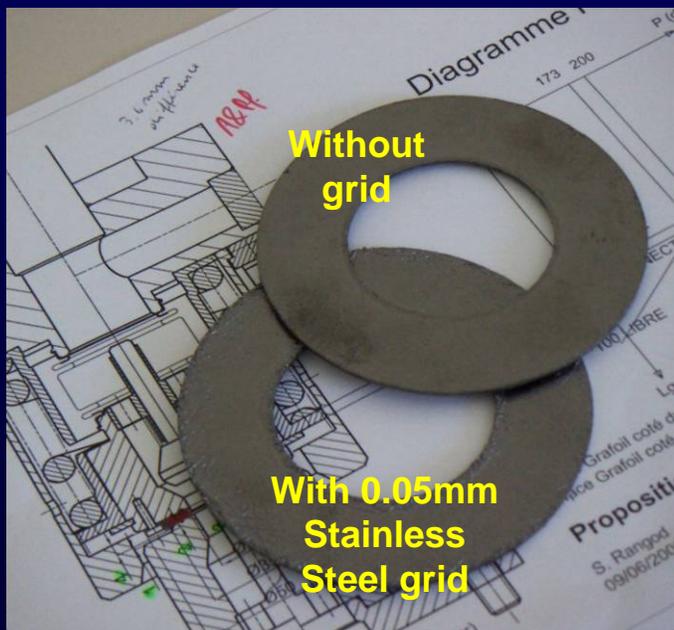
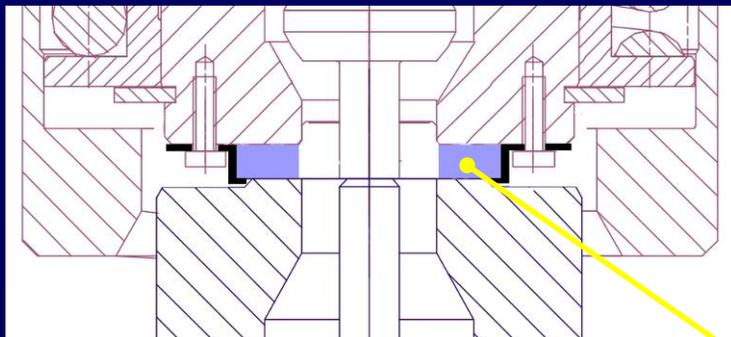
Horn Assembly (with all modifications)



The CNGS horn
"today" (building 887)

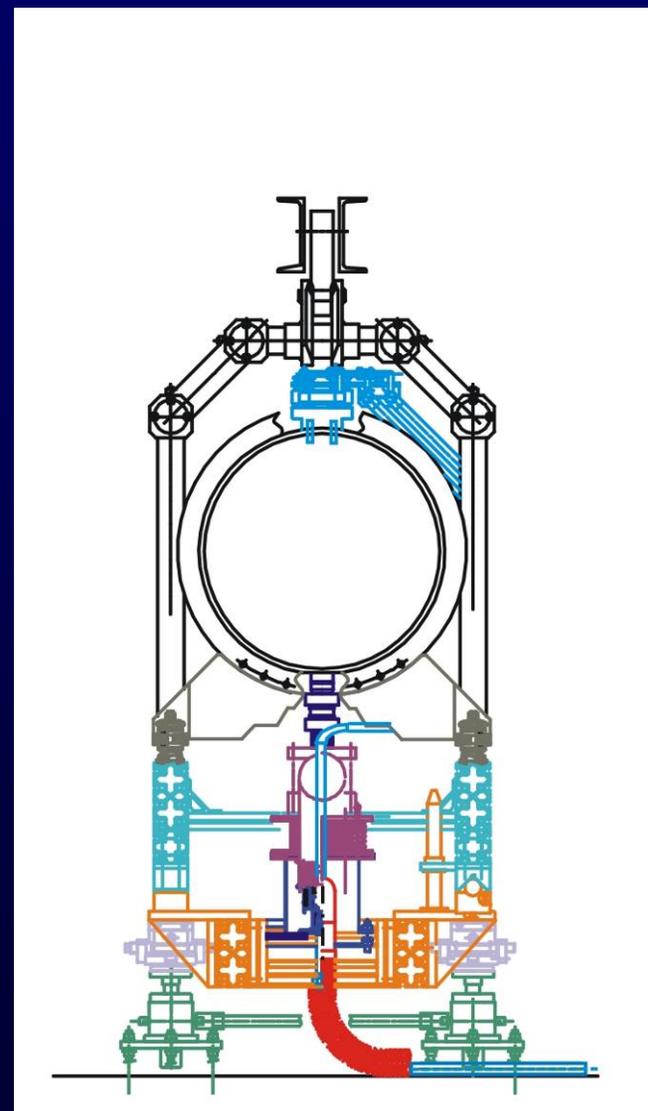
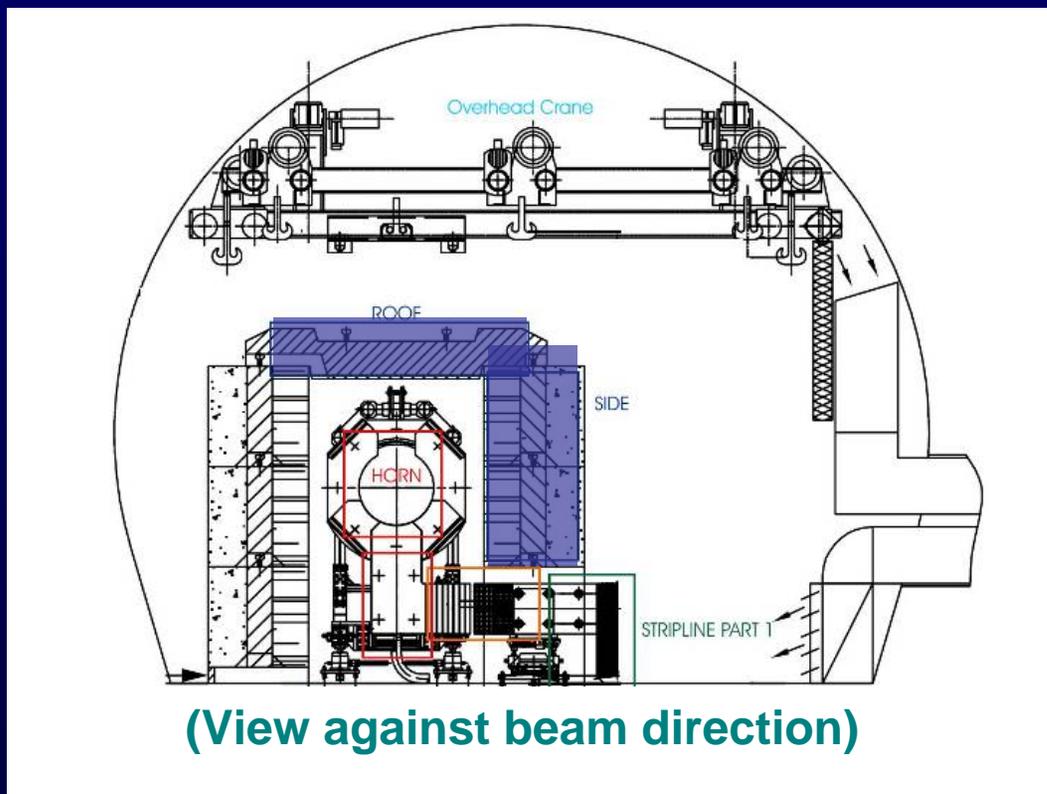


Plug-in Water Connection (grafoil seal)



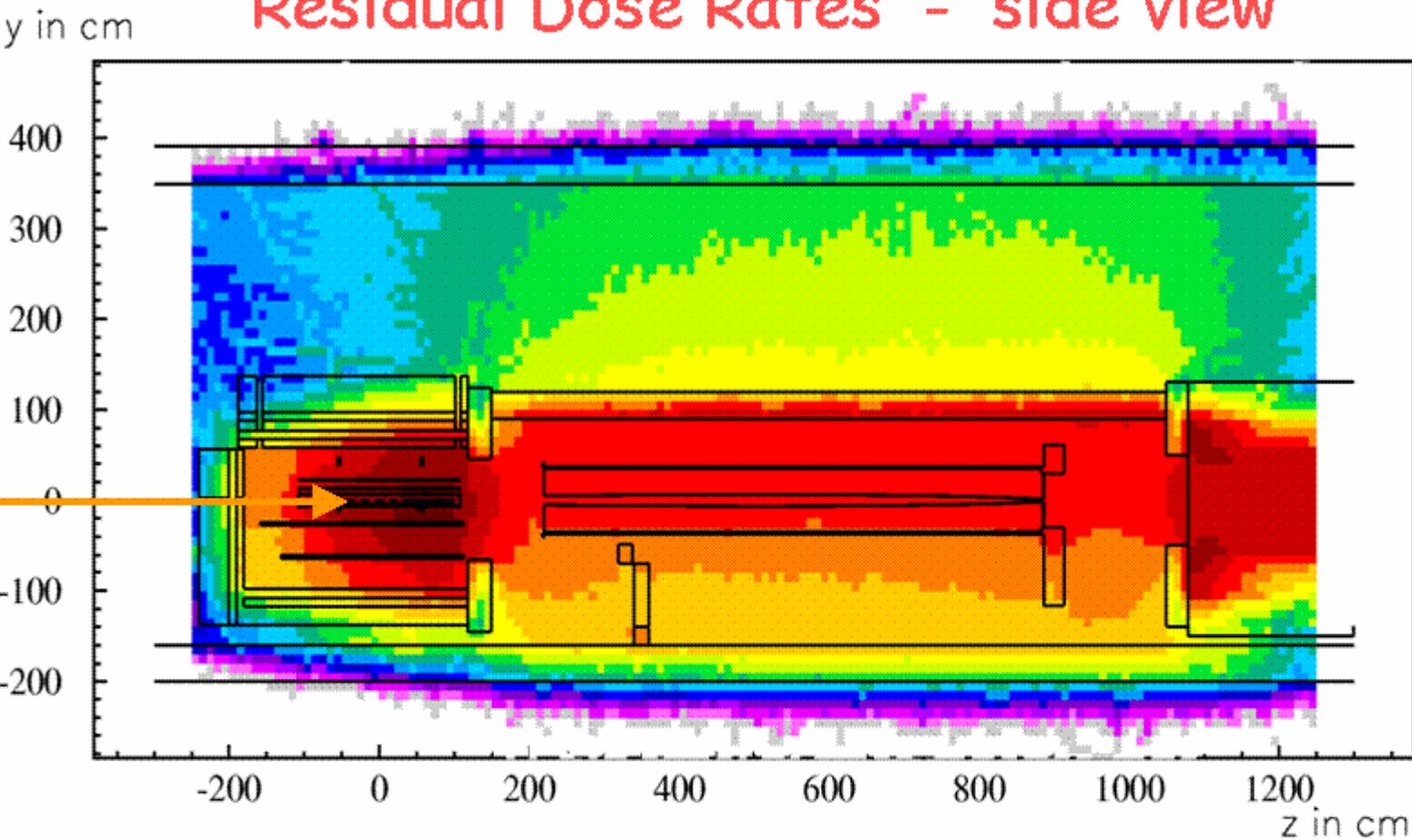
Horn Exchange*

*HAZOP study performed



Maximize remote & automatic action to minimize dose

Residual Dose Rates - side view



Target

Horn

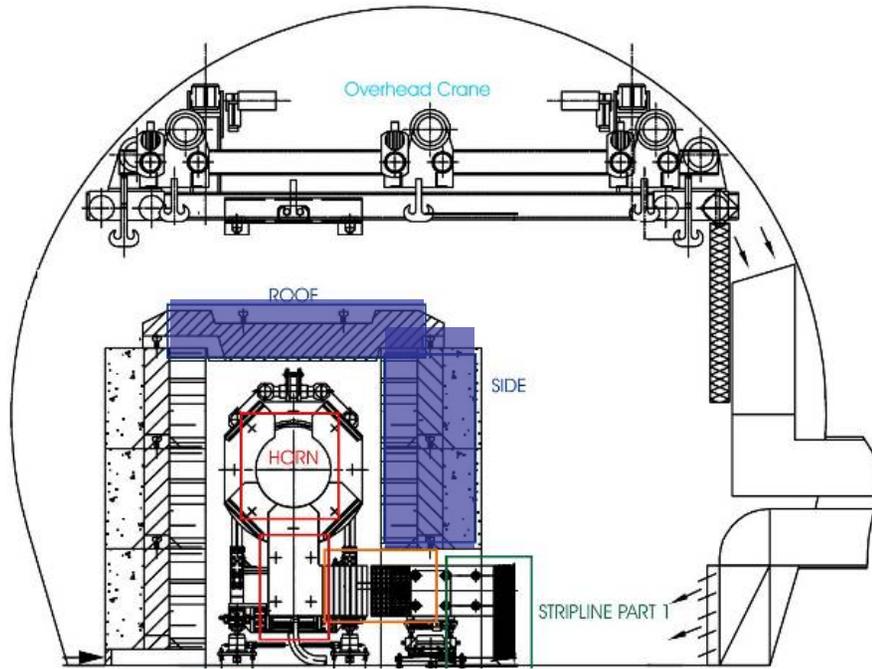
Collimator

Residual Dose Equivalent Rate (mSv/h)

200 days irradiation, 1 month cooling

8×10^{12} protons/s

Energy deposition - heating by particles



(View against beam direction)

Heating / Cooling - side view

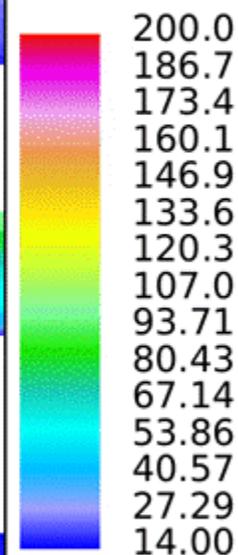
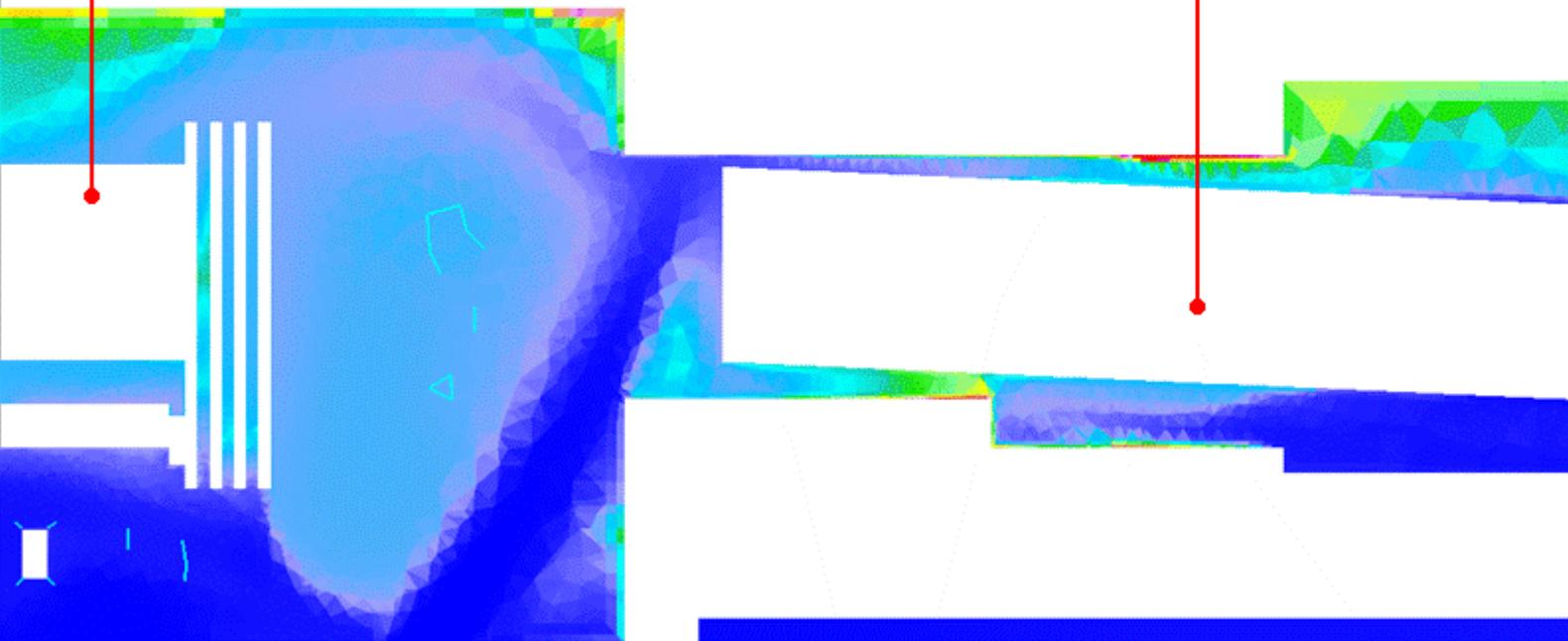


pro-STAR 3

31-MAY-05
Temperature
CELSIUS
TIME = 1000.0

Horn
(exit)

"Collimator" / He-tank
(Iron)



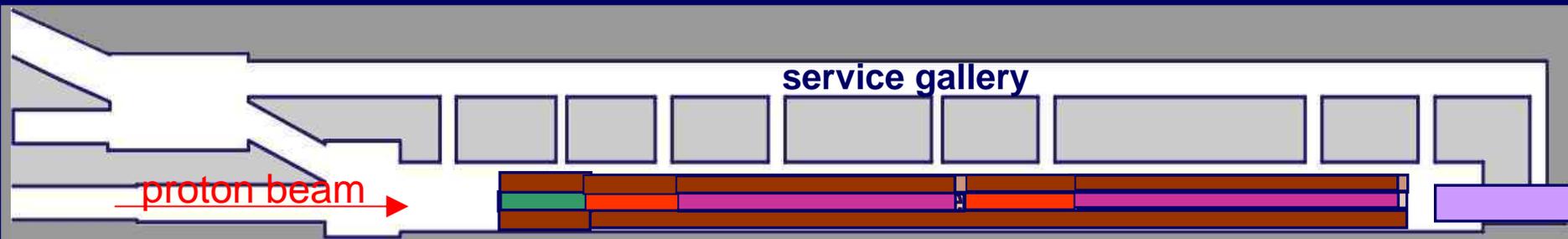
↑ cold air inlet
- new trench

Z

Y

X

Target Chamber: Shielding



Target chamber July 2004

21 July 2005

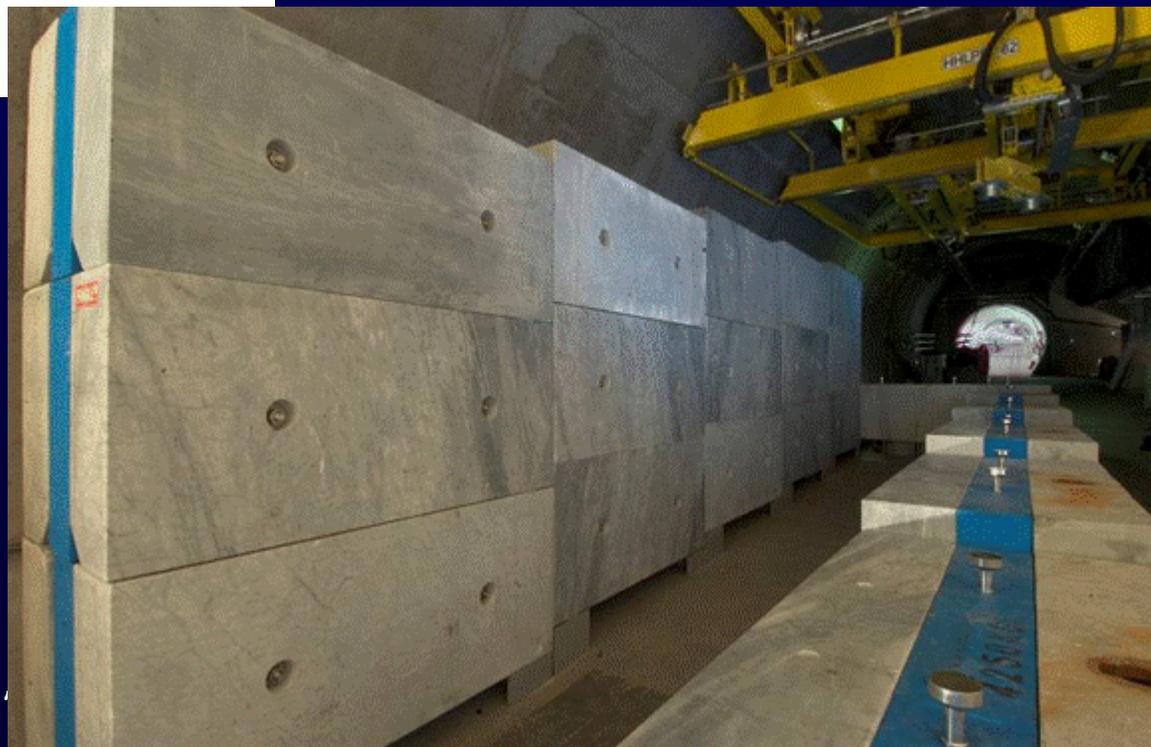
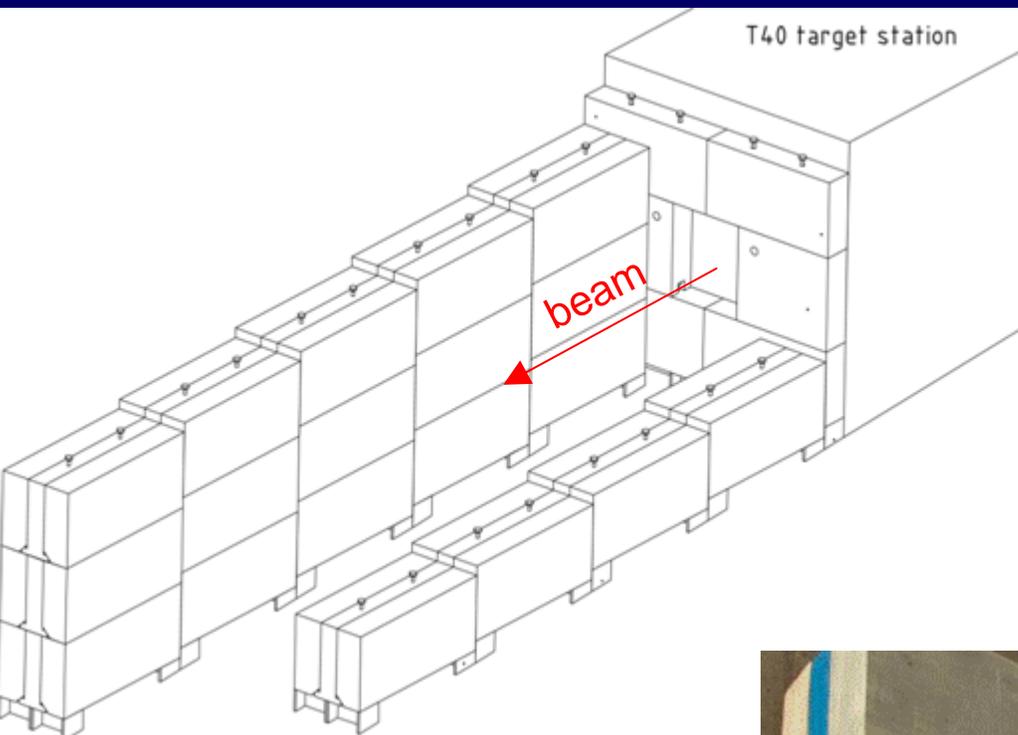


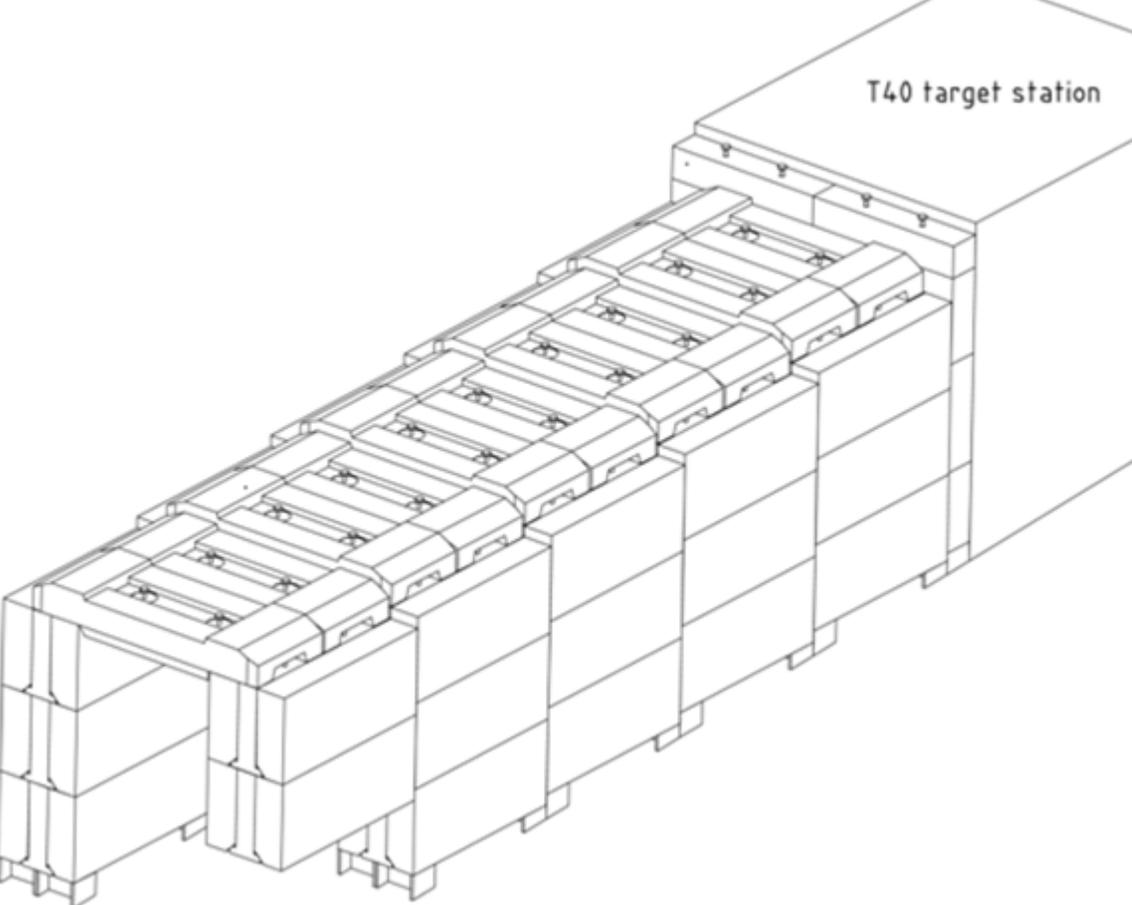
Target chamber July 2004

Target Chamber: Shielding



21 July 2005





Target Chamber: Helium Tanks

Alu Helium tube sleeve



Length ~5m
Diameter 800/1200mm
20 mbar over-pressure

21 July 2005





20 July 2005:
last element
of He tube
installed

21 July 2005



Outlook - the coming months...

- complete the installation of infrastructure / services
- complete the preparation, tests and installation of all equipment in TT41, TCC4 and TNM41/42

Our goal:

everything ready for hardware tests:

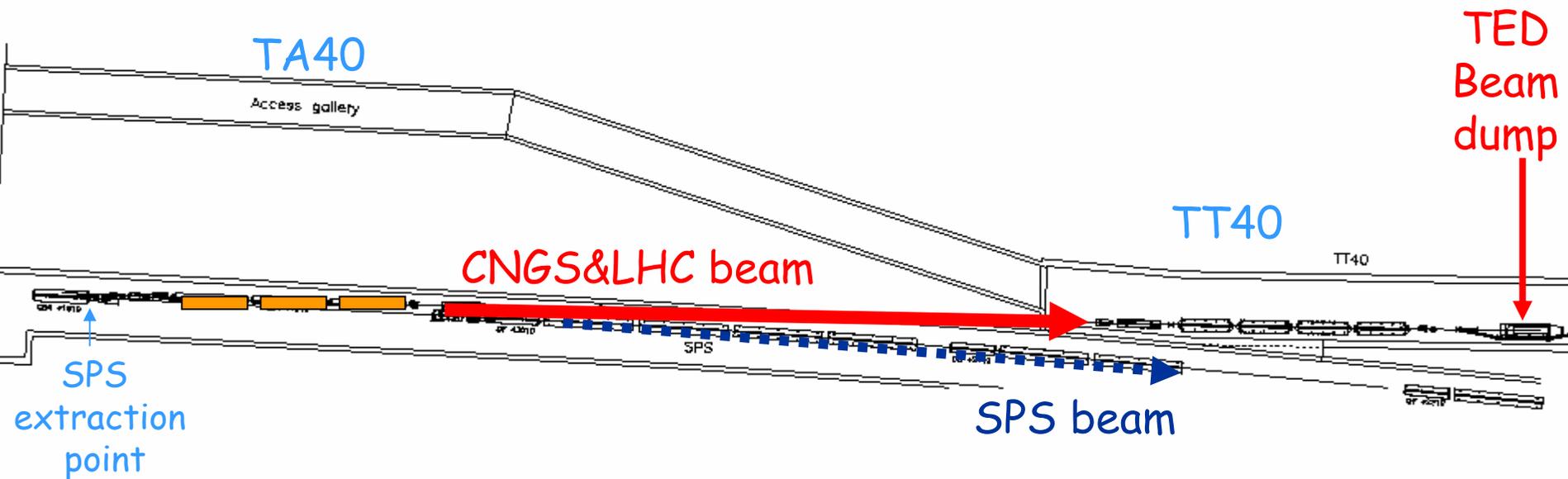
end of January 2006

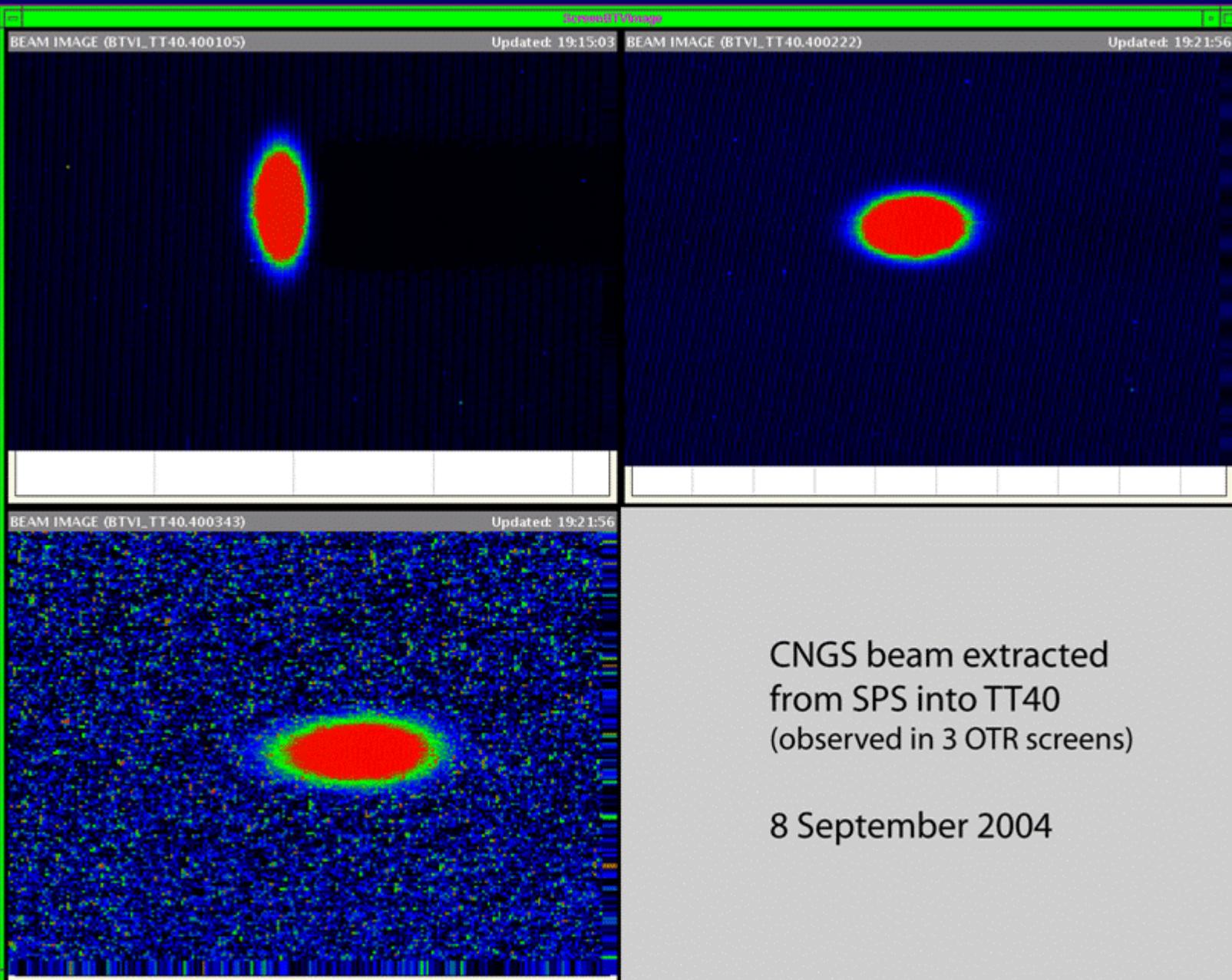
Commissioning



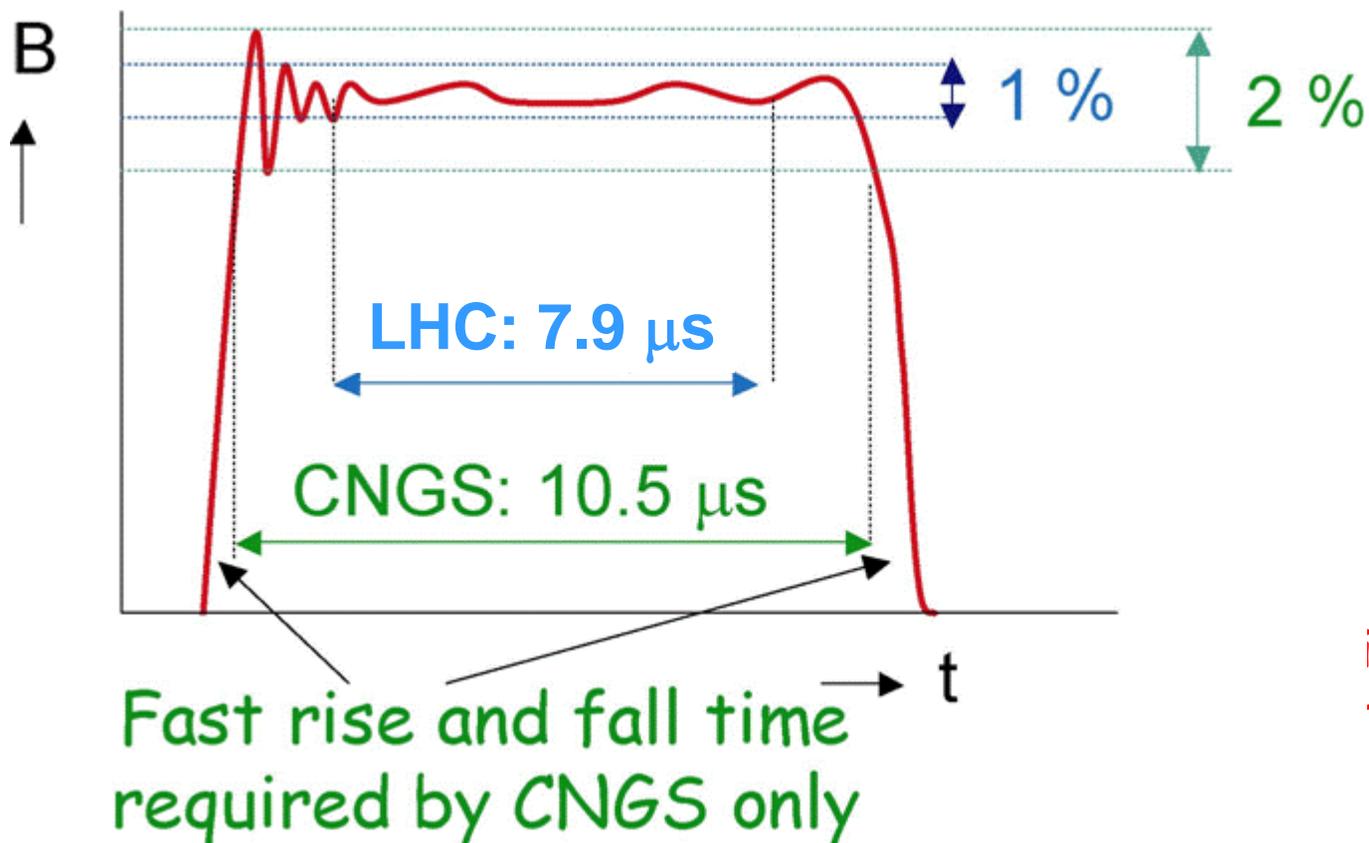
... has already started !! ...

Extraction tests - 2004





MKE - extraction kicker

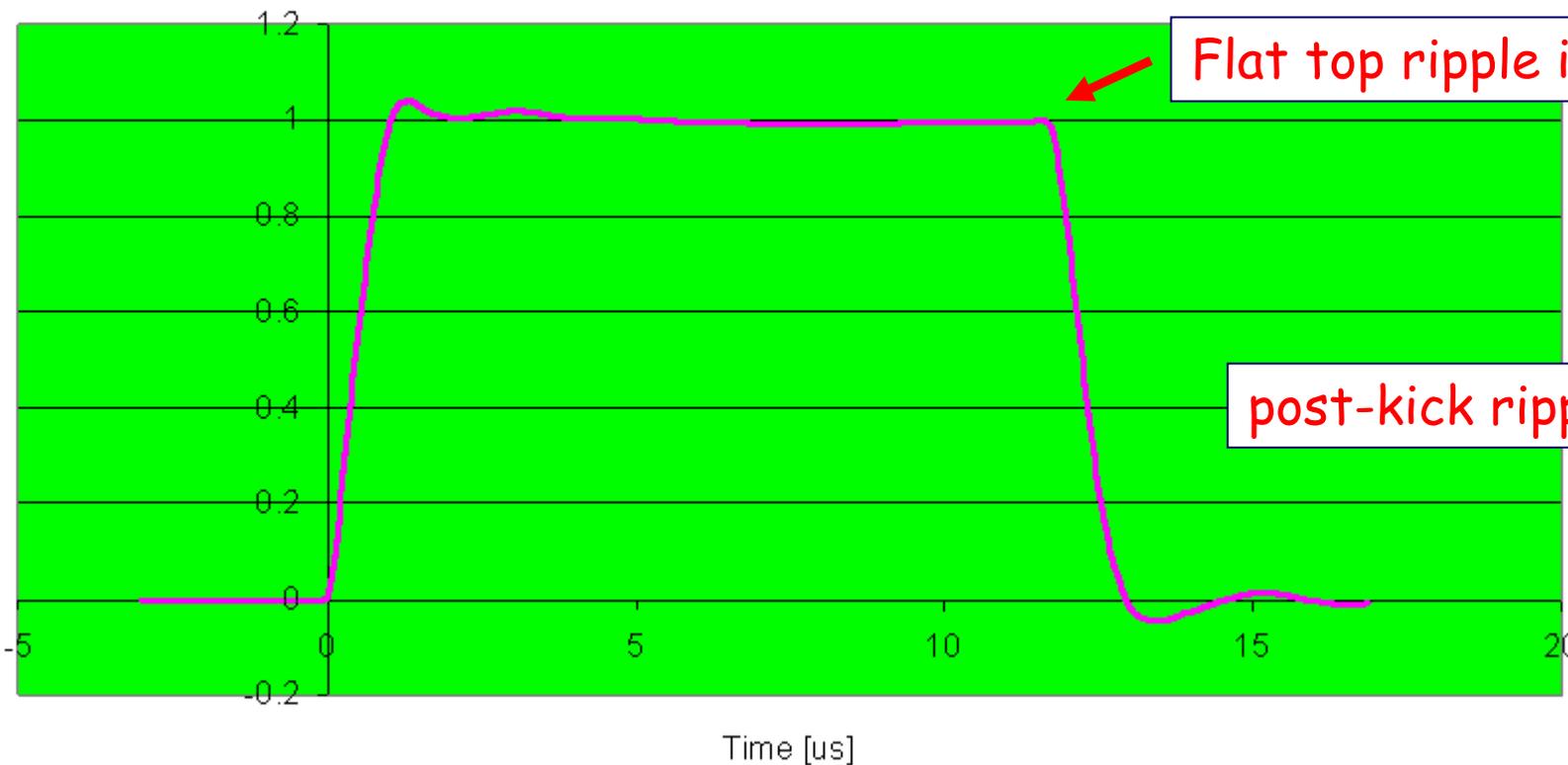


(Note: two such pulses are needed, 50 ms apart)



MKE - extraction kicker

Measured extraction kicker field

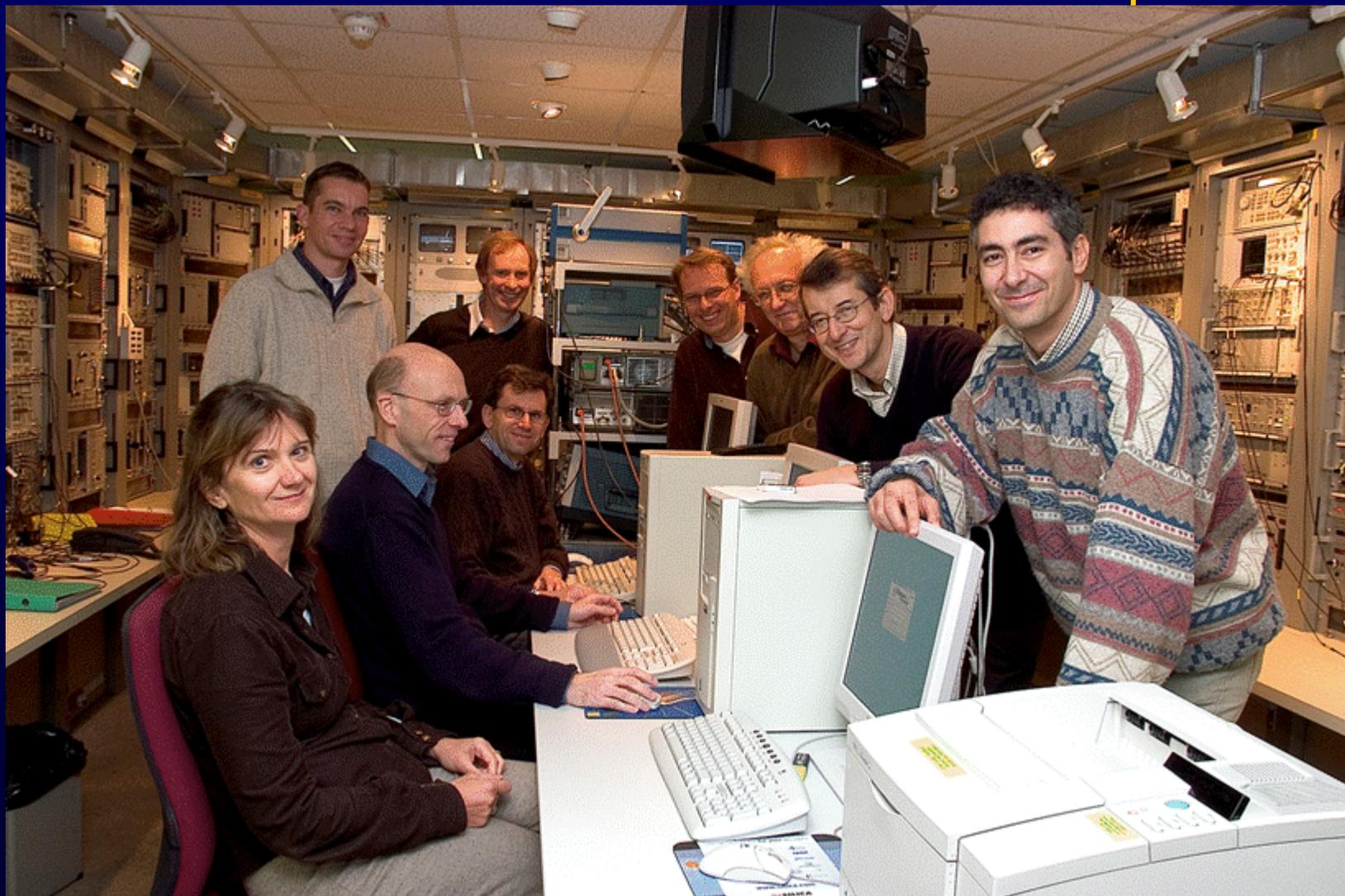


remaining effect from post-kick ripple:
removed using SPS damper

High intensity test in the SPS

reproduced the previous 1997 record +

reached a new record value: 5.26×10^{13} protons / cycle



Commissioning



- Hardware commissioning Feb. - April 2006

Beam instrumentations

Power supplies

Magnets (polarities)

Vacuum system

- "Dry runs" April - May 2006

Timing

Controls

Interlocks

Beam permit

Magnets (current & polarities)

- Commissioning with beam 2006: weeks 22, 25 and 27

LEIR comm
finishe

Wk	14	15	16	17	18	19	20	21	22	23	24	25	26
Mo	3	10	Easter 7	24	1 May 1	8	15	22	Int. tests	Whit. 5	12	Int. tests	26
Tu									CNGS COMM. PHASE 1			CNGS COMM. PHASE 2	
We	PS cold check out									SPS Scrubbing			
Th	SPS	HW tests		SPS cold check out				Ascension					
Fr		G.Friday											
Sa													
Su								T18 tests					

← 18 s SC = FT+CNGS →

Commissioning schedule (draft)

Wk	27	28	29	30	31	32	33	34	35	36	37	38	39
Mo	Int. tests	Tech.Stop	17	24	31	7	14	21	28	4	11	18	Tech.Stop
Tu	CNGS COMM. PHASE 3		LSS6				LSS6 res.	LSS4/6		LSS4/6			LHC scrub test
We		900 ms conversion for the entire Complex???											
Th										Jeûne G.		PS ion	PS ion
Fr													
Sa													

Week 22 : low intensity, up to target

Week 25 : low to medium intensity, secondary beam

Week 27 : high intensity, full facility



Summary

- > CNGS approved in Dec. 1999, work started Sept. 2000
- > CNGS project is well under way
... although there are still some worries...
- > commissioning with beam:
to start week 22 (29 May 2006)
- > Our goal:
CNGS beam operational after week 27 (July 2006)



thanks !

... for the transparencies presented by several colleagues
at the NBI2005 workshop, 7-11 July, Fermilab

... for the photos taken by colleagues and by CERN photolab