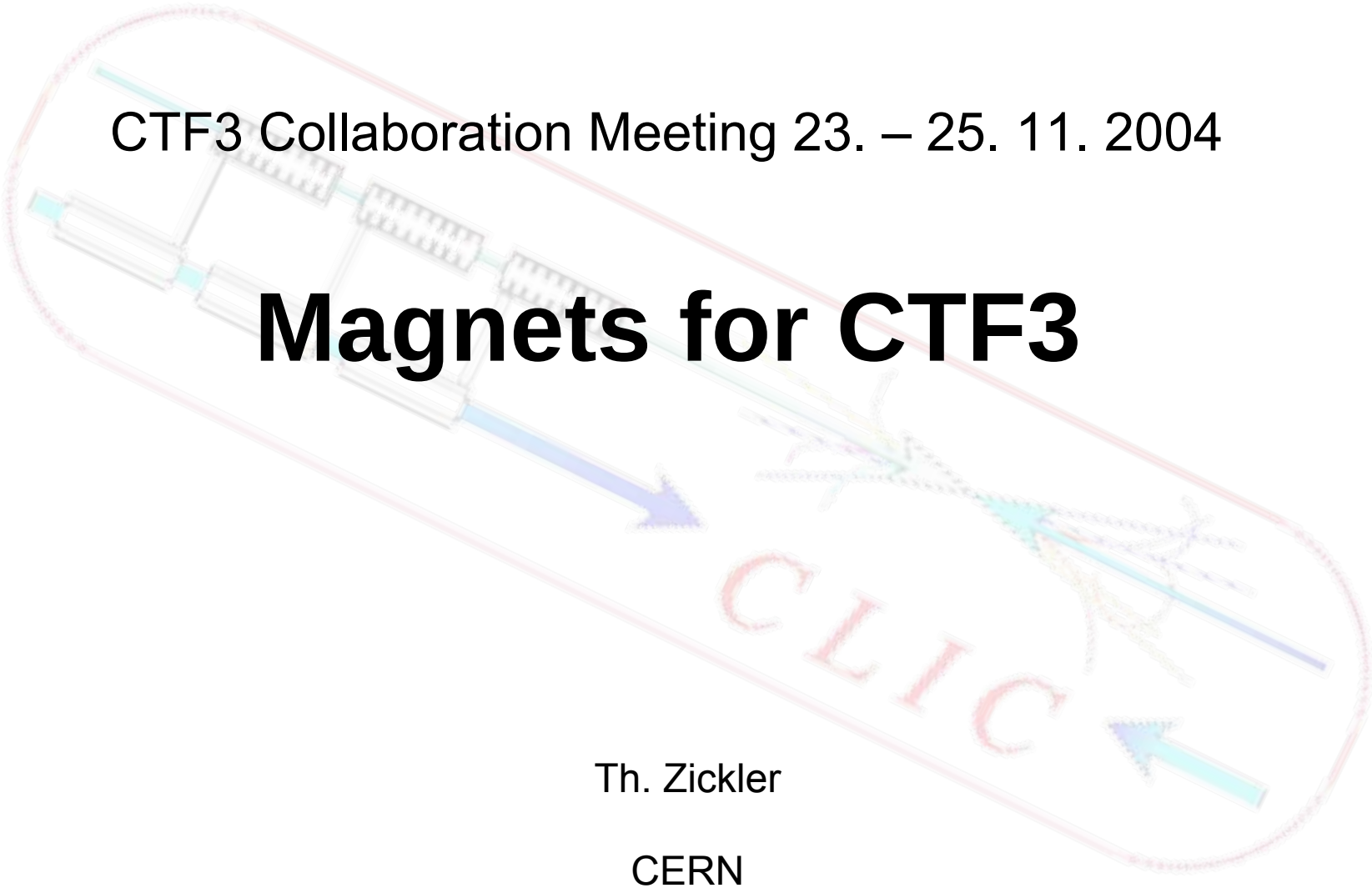
CTF3 Collaboration Meeting 23. – 25. 11. 2004

Magnets for CTF3



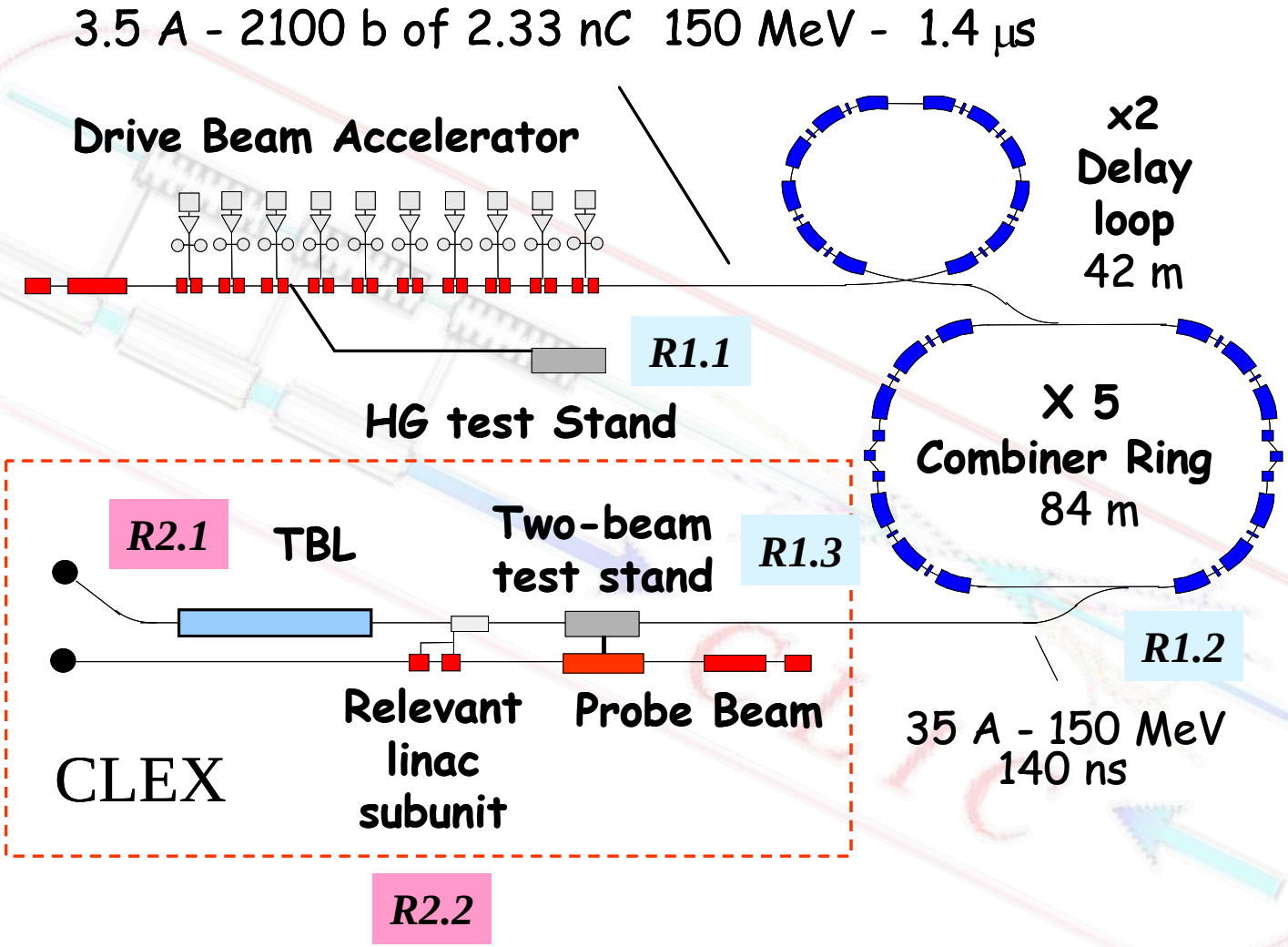
Th. Zickler

CERN

Magnets for CTF3

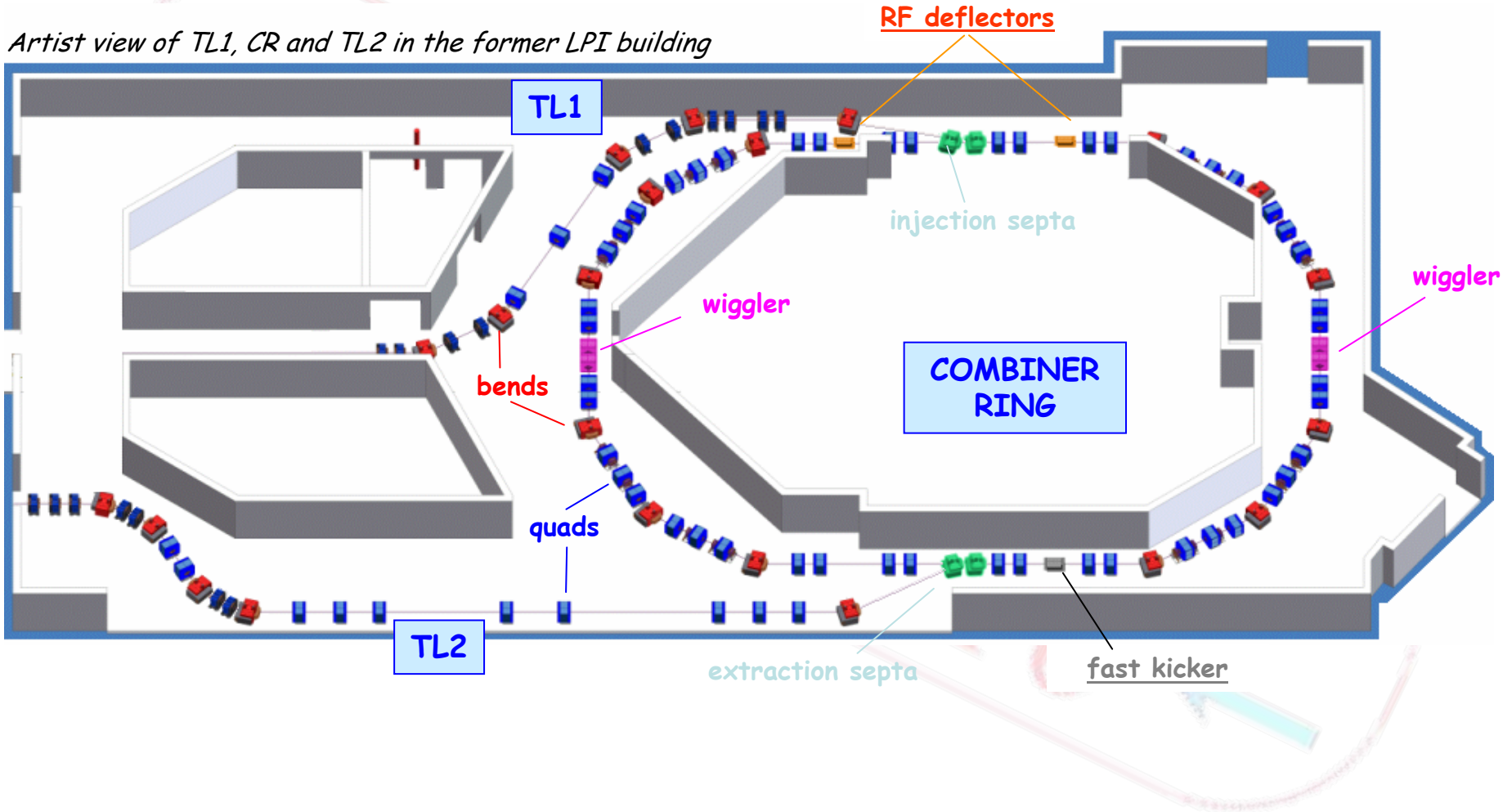
- Slim Quadrupoles QG for TL1, CR and TL2
- Corrector Magnets for TL1, CR and TL2
- Recuperated Quadrupoles from LURE for CR
- Sextupoles XC for CR
- Bending Magnets BF for TL2
- Quadrupoles for TL2 (CELSIUS)
- Quadrupoles for TBL and TB test stand
- Wigglers for DL and CR

CTF3 Layout


3.5 A - 2100 b of 2.33 nC 150 MeV - 1.4 μs
Drive Beam Accelerator
x2
Delay
loop
42 m
R1.1
HG test Stand
X 5
Combiner Ring
84 m
R2.1
TBL
Two-beam
test stand
R1.3
R1.2
Relevant
linac
subunit
Probe Beam
35 A - 150 MeV
140 ns
CLEX
R2.2

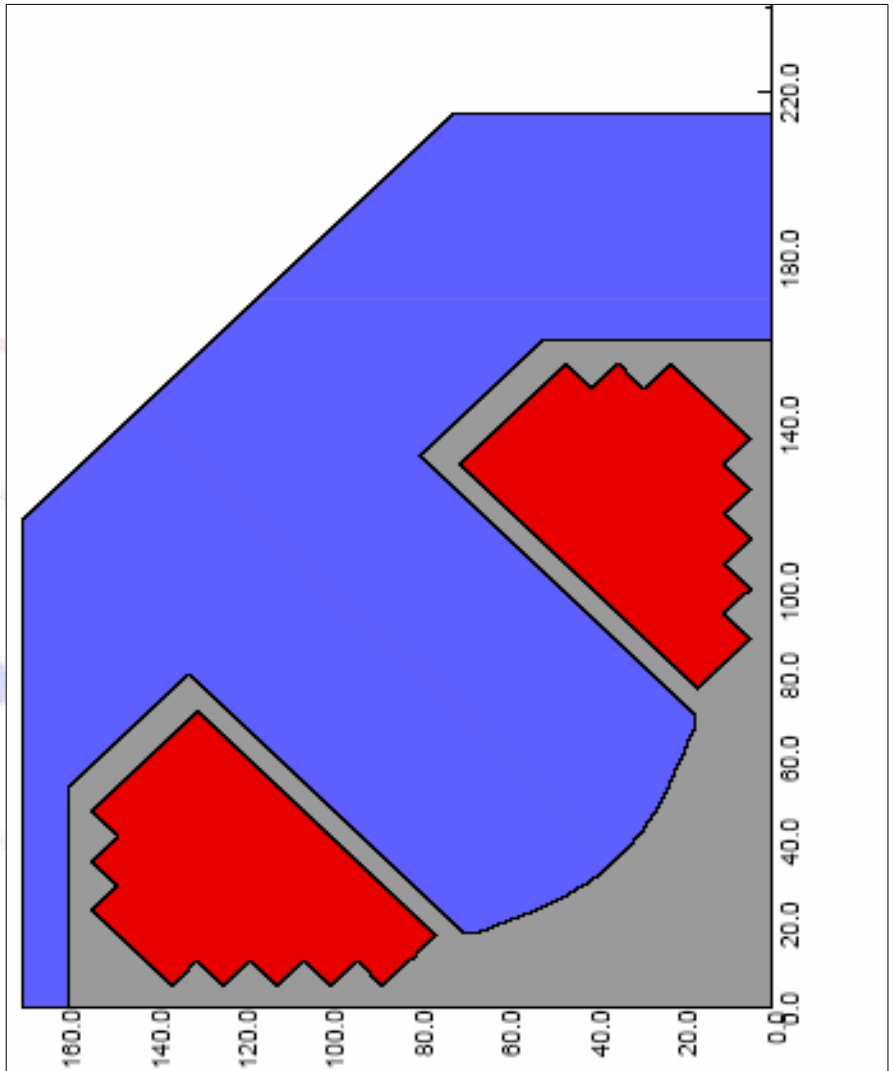
CTF3 Layout

Artist view of TL1, CR and TL2 in the former LPI building



QG Slim Quadrupole Magnets

- 11 QG Quadruples (+1 set of spare coils) needed for the combiner ring (2) and the TL1 (4), TL2 (4) transfer lines
- New design made by B. Langenbeck respecting the restricted space near the injection and extraction areas of the combiner ring (figure-of-eight type)



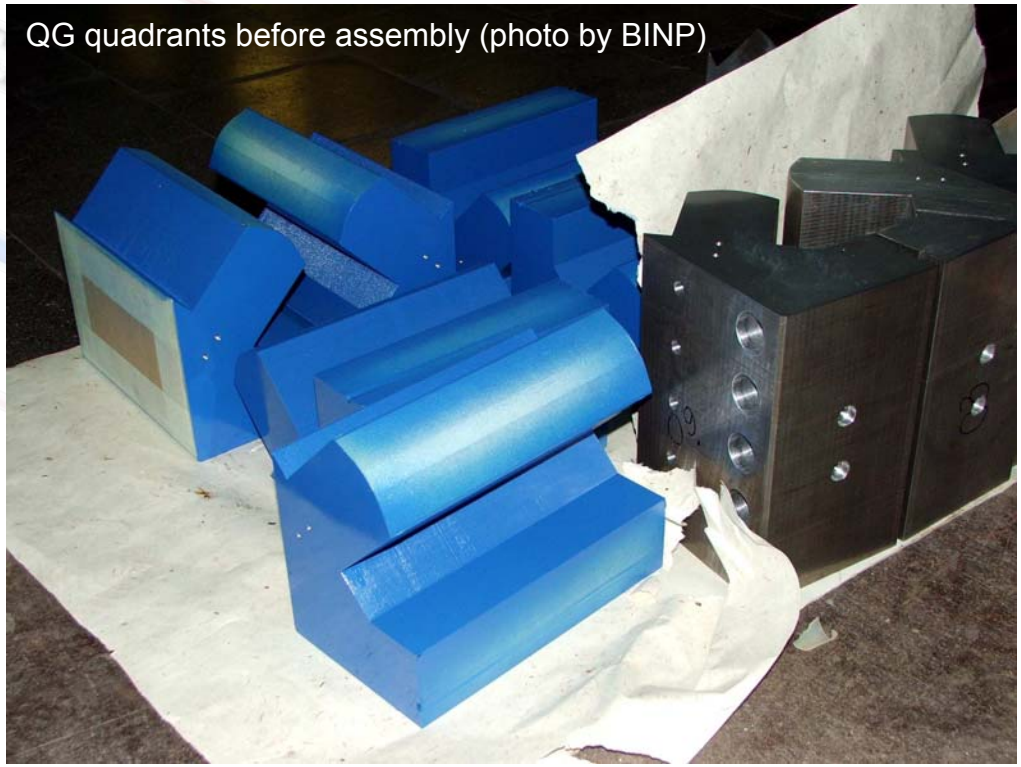
Magnet quadrant cross section from OPERA (by B. Langenbeck)

QG Main Parameters

Nominal field gradient	8 T/m
Nominal current	195 A
Yoke length	253 mm
Bore diameter	100 mm
Integrated field ∫B·dl	2.4 Tm/m
Resistance	< 85 mΩ
Inductance	~ 17 mH
Dissipated power	3 kW
Total weight	250 kg

QG Production Status

- Manufacturing by BINP/Novosibirsk
- Contract was signed in October 2004
- 35 quadrants (~ 8 complete magnets) manufactured
- All quadrants mechanically measured at BINP and within Specification
- 4 coils manufactured and actually under test
- 1 support manufactured
- Production delay - delivery foreseen beginning of 2006


QG quadrants before assembly (photo by BINP)

H/V Corrector Magnets

- 33 Horizontal/vertical corrector magnets including supports needed for the combiner ring (20) and the TL1 (5), TL2 (5) transfer lines
- Design based on Delay Loop correctors from Frascati
- Spanish contribution via CIEMAT
- Manufacturing at ANTEC, Spain
- All laminations are punched
- 2 prototypes manufactured and send to CERN for approval
- Mechanical design approved with minor modifications
- Magnetic measurements delayed due to an accident in hall 867
- Delivery foreseen beginning of 2006


Corrector magnets arrived at CERN

Corrector Main Parameters

Nominal field	9.8×10^{-3} T
Nominal current	± 7 A
Yoke length	100 mm
Horizontal aperture	128 mm
Vertical aperture	128 mm
Integrated field $\int B \cdot dl$	0.003 Tm
Resistance per plane	310 mΩ
Inductance per plane	84 mH
Dissipated power	31 W

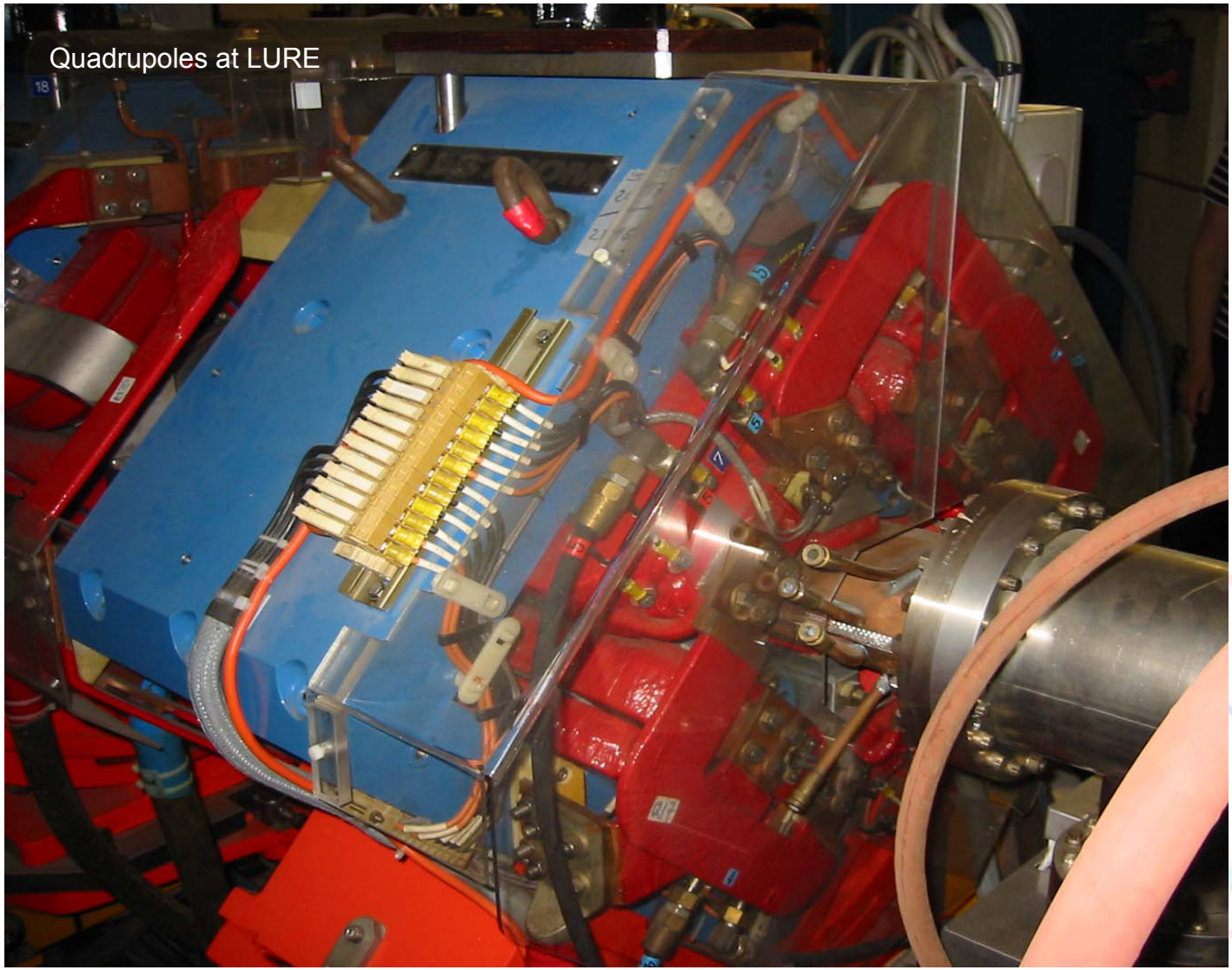
LURE Quadrupoles for CR

- 32 Quadrupoles became available after the closing of the SUPER ACO ring at LURE/Orsay in 2003
- Letter of intention from the DG has been signed in 2004
- LURE has received the green light from the French authorities for dismantling only end of September 2005
- An European “Call for Tender” for the dismantling work has been sent out by LURE this month (delay: 50 days)
- Therefore: Dismantling and shipment of the first batch (16 magnets) not before end of March 2006
- …but: a prototype will be sent as soon as possible to study the necessary modifications to be done at CERN (removal of compensation and sextupole coils, refurbishment of the cooling circuit, modification of the electrical connections, etc…by AB and AT/MEL)
- Tests and measurement before installation (AT/MEL)

LURE Quads Main Parameters

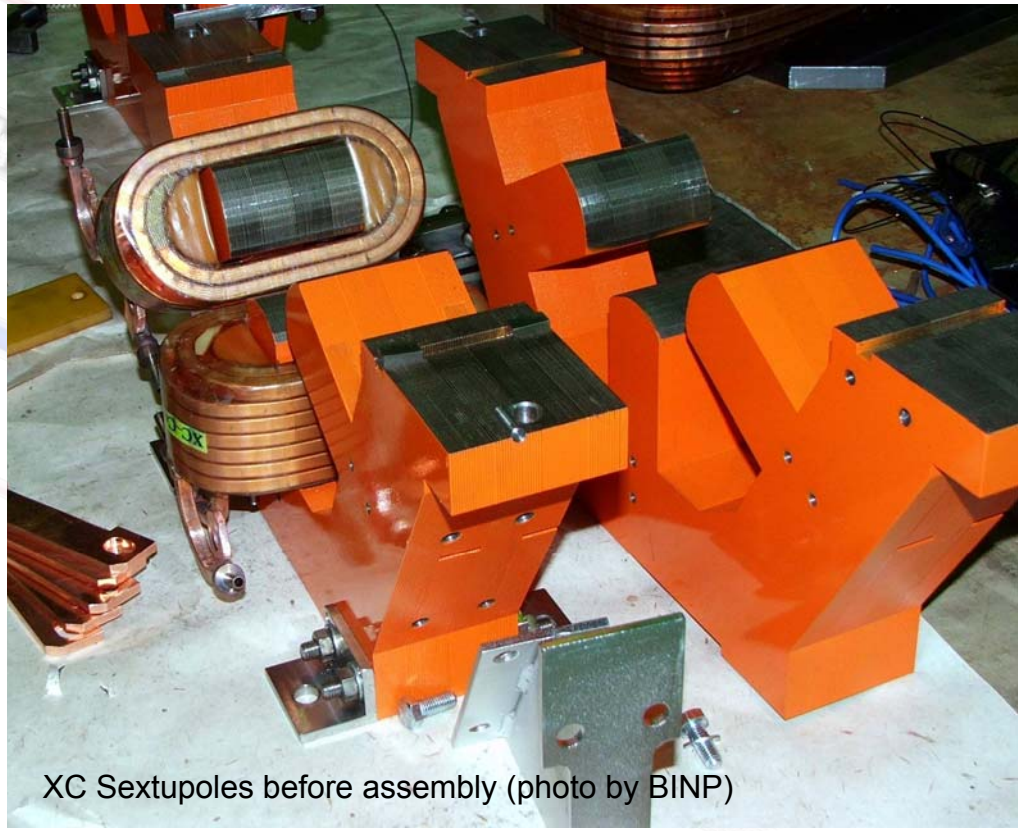
Solid non-laminated yoke for DC operation	
Nominal field gradient	8 T/m
Nominal current	450 A
Yoke length	320 mm
Bore diameter	120 mm
Integrated field ∫B·dl	3.2 Tm/m
Resistance	54 mΩ
Dissipated power	10.8 kW
Total weight	670 kg

Quadrupoles from LURE



XC Sextupole for Combiner Ring

- 26 XC Sextupole magnets (+2 set of spare coils) needed for the combiner ring
- Modified design based on Delay Loop Sextupoles from Frascati
- Contract with BINP signed in October 2004
- Laminations still slightly out of tolerance (~ 0.02 mm)
- 4 half cores (2 magnets) manufactured and mechanically measured
- 6 coils manufactured and tested
- Magnet assembly and magnetic measurements presently ongoing
- 1 support manufactured
- Production delayed - delivery foreseen beginning of 2006



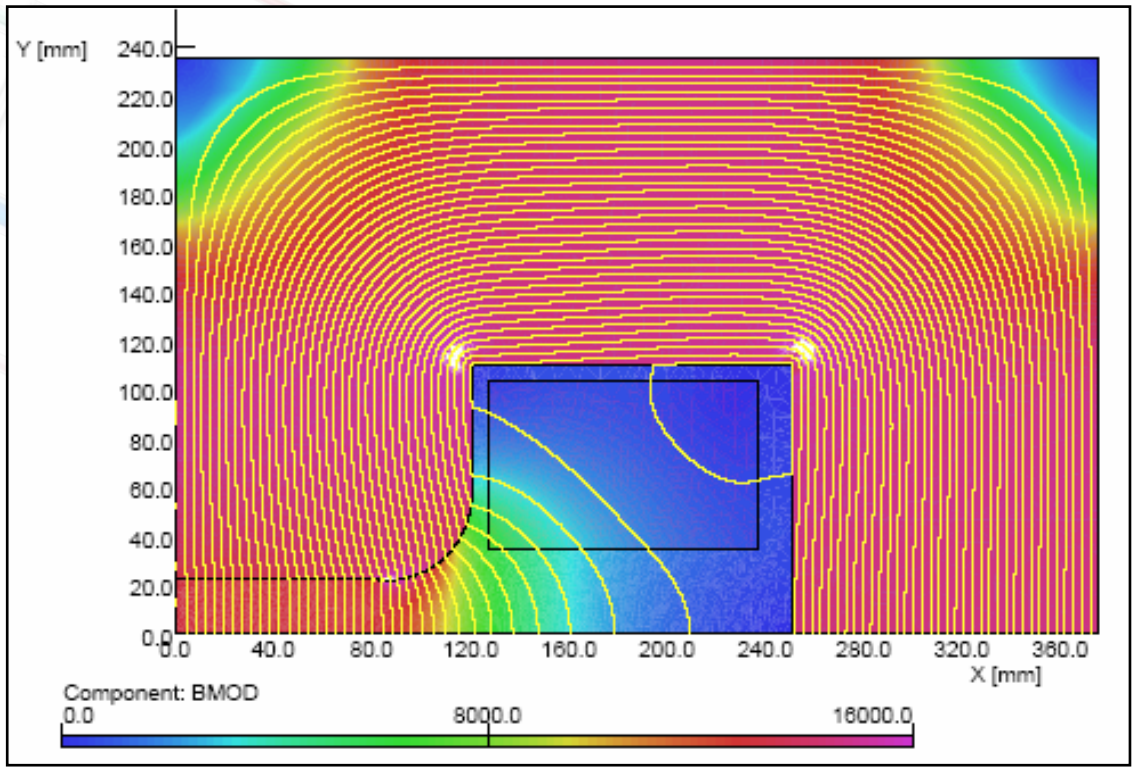
XC Sextupoles before assembly (photo by BINP)

XC Main Parameters

Nominal sextupole gradient	180 T/m^2
Nominal current	280 A
Yoke length	100 mm
Bore diameter	108 mm
Resistance	< 16 mΩ
Inductance	~ 0.93 mH
Dissipated power	1.4 kW
Total weight	60 kg

BF Bending Magnets

- 6 BF bending magnets needed for the TL2 transfer line (5 + 1 spare)
- Design based on the EPA bending magnets (zero gradient)
- Magnetic design and Specification already finished by B. Langenbeck
- Mechanical design (drawings) presently in preparation
- Magnets are needed for 2007
- Manufacturing has to be started beginning of 2006 for a delivery in time

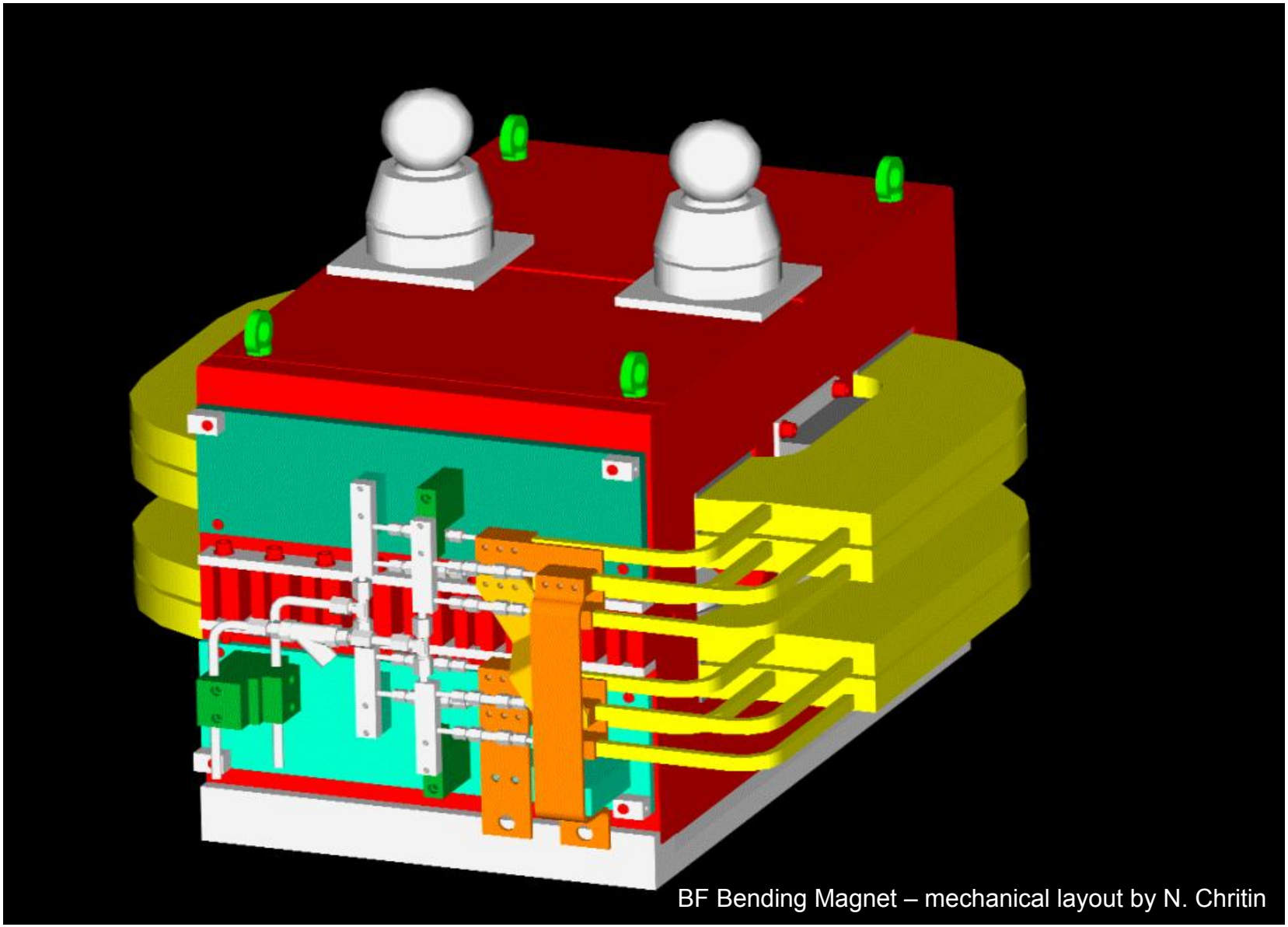


Flux distribution calculated in Opera (by B. Langenbeck)

BF Main Parameters

Nominal field	1.3 T
Nominal current	570 A
Yoke length	465 mm
Gap height	45 mm
Integrated field ∫B·dl	0.611 Tm
Resistance	< 30 mΩ
Inductance	~ 25 mH
Dissipated power	9.3 kW
Total weight	1200 kg

BF Mechanical Layout



BF Bending Magnet – mechanical layout by N. Chritin

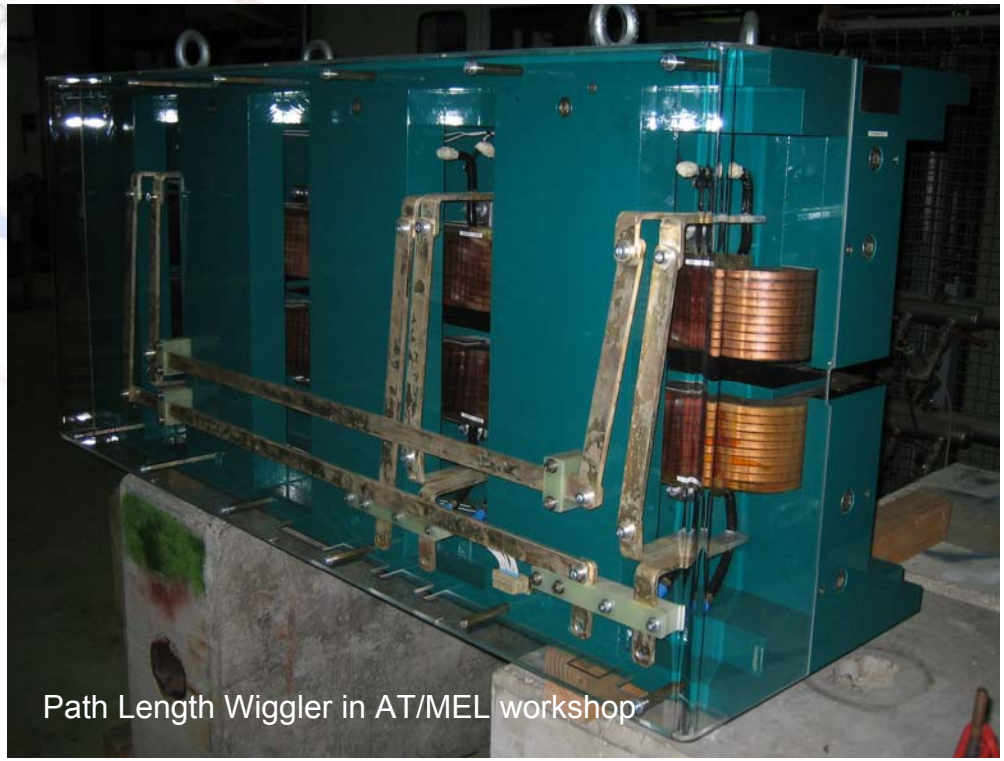
Quadrupoles for TL2

- 16 Quadrupoles and several bending and corrector magnets became available after the closing of CELSIUS in Uppsala/Sweden
- All magnets have been dismantled and shipped to CERN
- Arrival at CERN last week
- Modification of the water and electrical connections required (AB)
- Tests and measurement before installation (AT/MEL)
- Installation in 2006

Magnets form CELSIUS arriving at CERN

Path Length Wigglers

- 2 Path Length Wiggler needed for the Combiner Ring
- Manufacturing of 2 wigglers for the DL finished by Sigmaphi/France
- Both magnets delivered to CERN
- 1 wiggler already installed in the Delay Loop
- 1 wiggler delivered to AT/MEL workshop for testing
- Water connection missing and coils not correctly fixed
- Therefore: modification and repair required for both magnets



Path Length Wiggler in AT/MEL workshop

Magnets for CLEX

- Test beam line TBL
  - 18 Quadrupoles including precision moving tables needed for TBL
  - Preliminary magnetic design finished by B. Langenbeck
  - Moving tables designed by CIEMAT
  - Spanish contribution via CIEMAT
  - Required for 2008
- Two-beam test stand
  - Beam line design not yet existing
  - ~12 - 16 Quadrupoles, 2 - 4 Dipoles and 6 - 8 corrector magnets needed (preliminary estimation)
  - Work not yet started
  - Swedish contribution (to be confirmed)
  - Required already for 2007

Summary

- All magnets for TL1, TL2 and CR (11 new quadrupoles, 48 refurbished quadrupoles, 26 sextupoles and 33 correctors, 6 dipoles) are funded, contracts are placed and work is progressing
- Magnet production in BINP delayed, but not yet critical
- Magnets for CLEX: magnetic design in preparation
- Concerns & risks:
  - LURE quads not available before March 2006 and major modification at CERN still necessary
  - Magnets for TB test stand already needed for 2007, but the beam line design is not yet ready