Power Supplies for TESLA Test Facility 2

Hans-Jörg Eckoldt

DESY

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Structure of the talk

- Introduction to TESLA
- TESLA Test facility
- Tunnel layout
- Power Supplies
- New Challenges
- Developments
- Ideas for commissioning
- Conclusions

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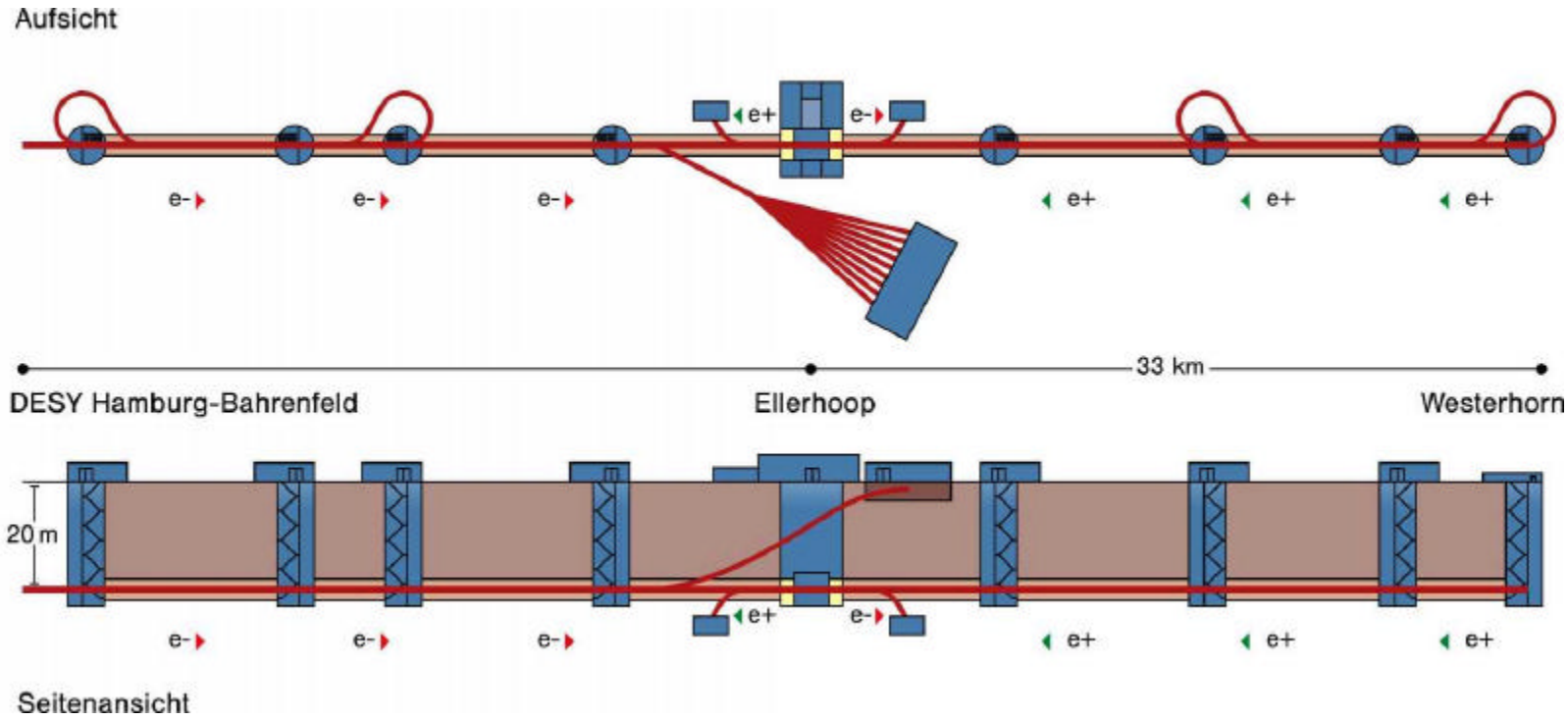
Overview TESLA



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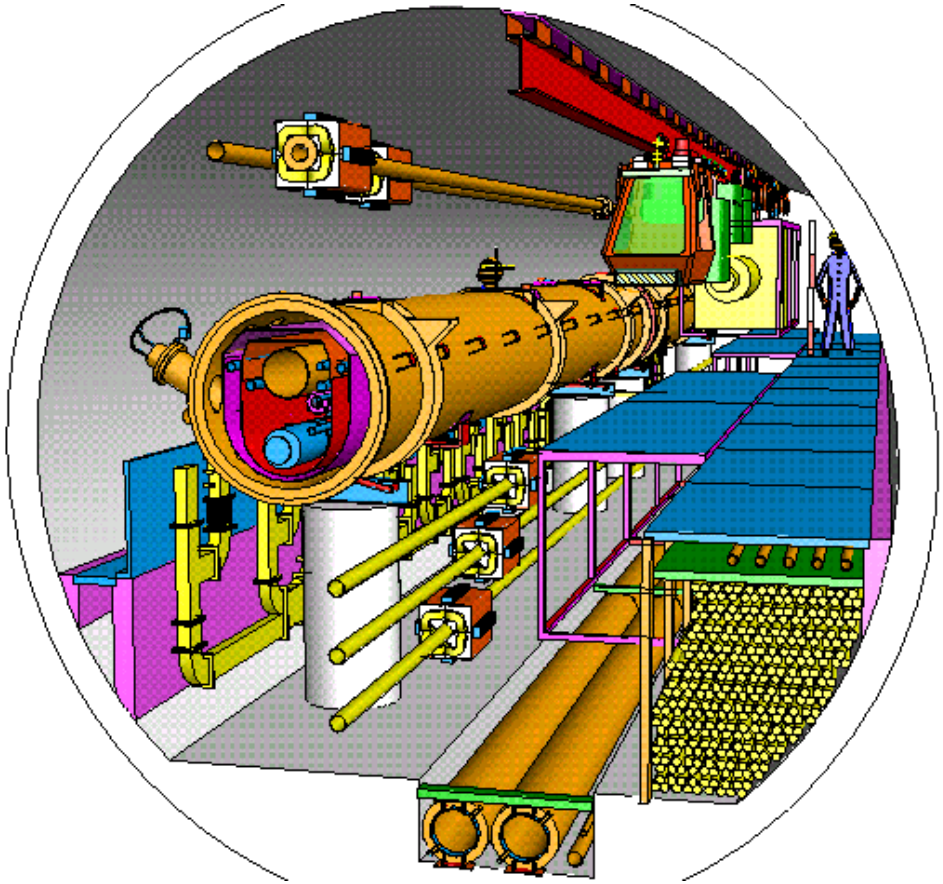
View of TESLA tunnel



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New tunnel layout of TESLA Tunnel

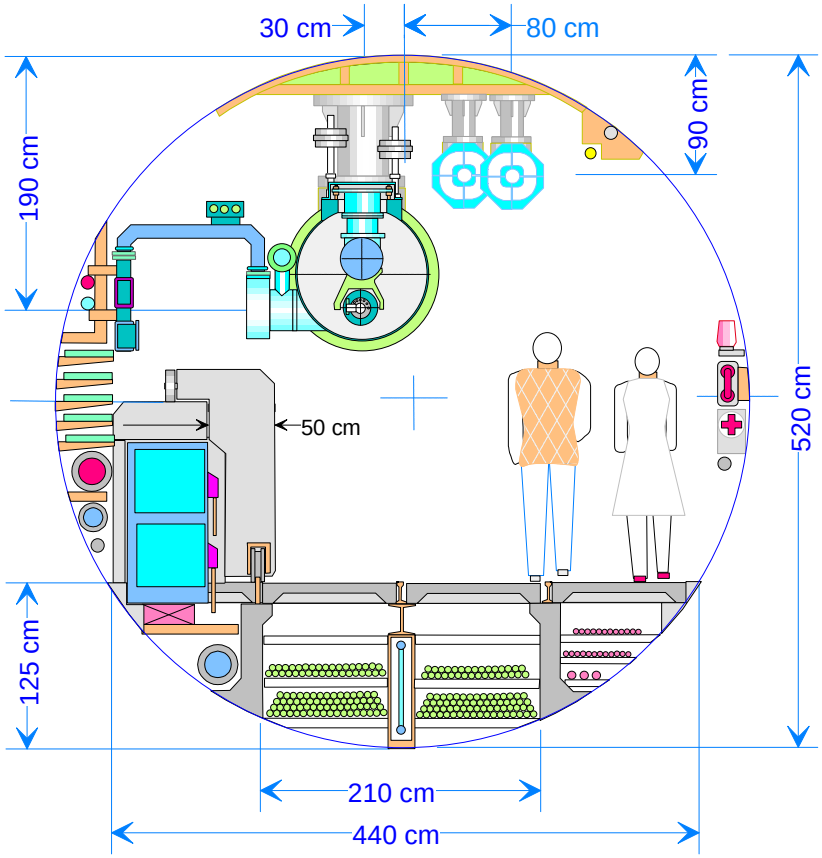

Figure 2. Main LINAC, Damping Ring & Electronic Station

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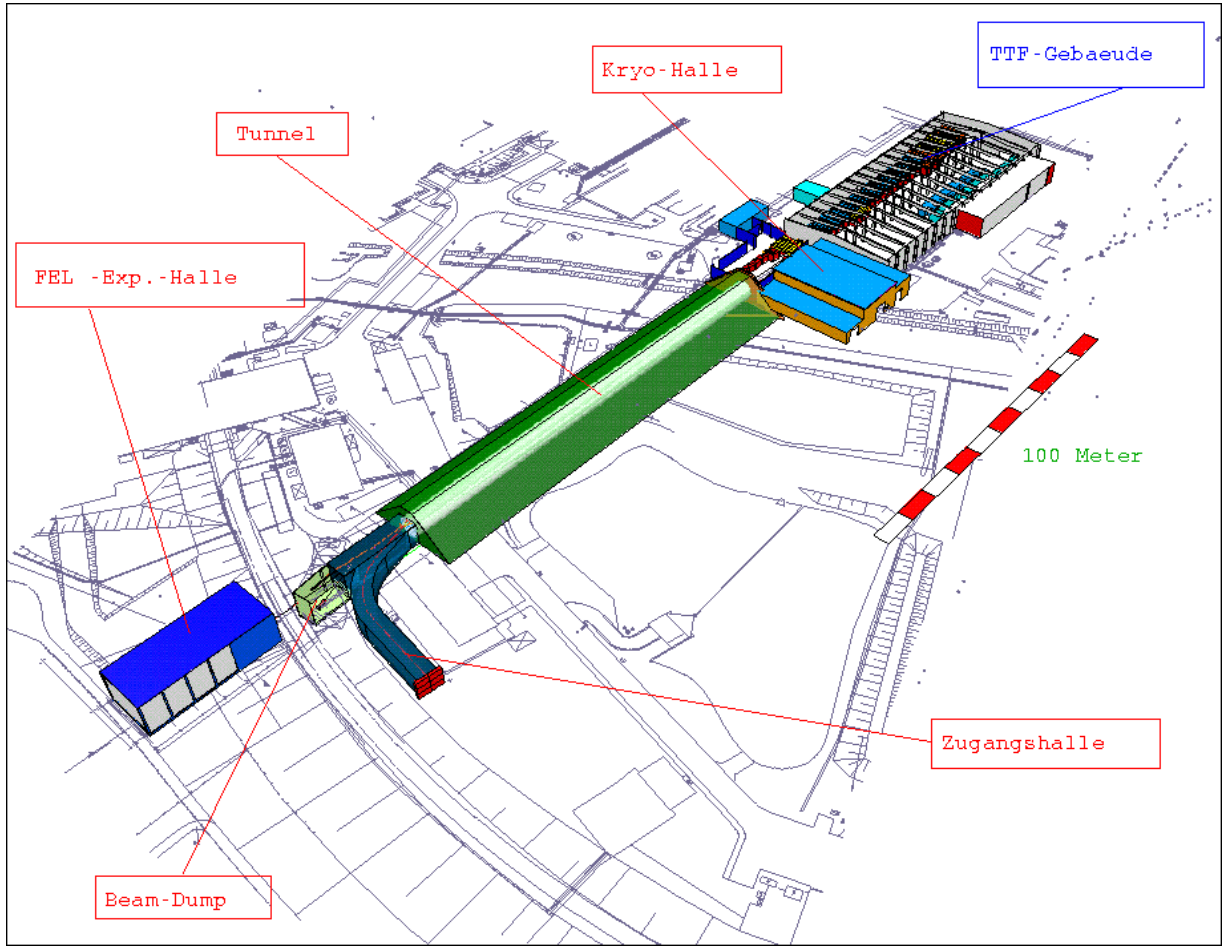
Overview over site



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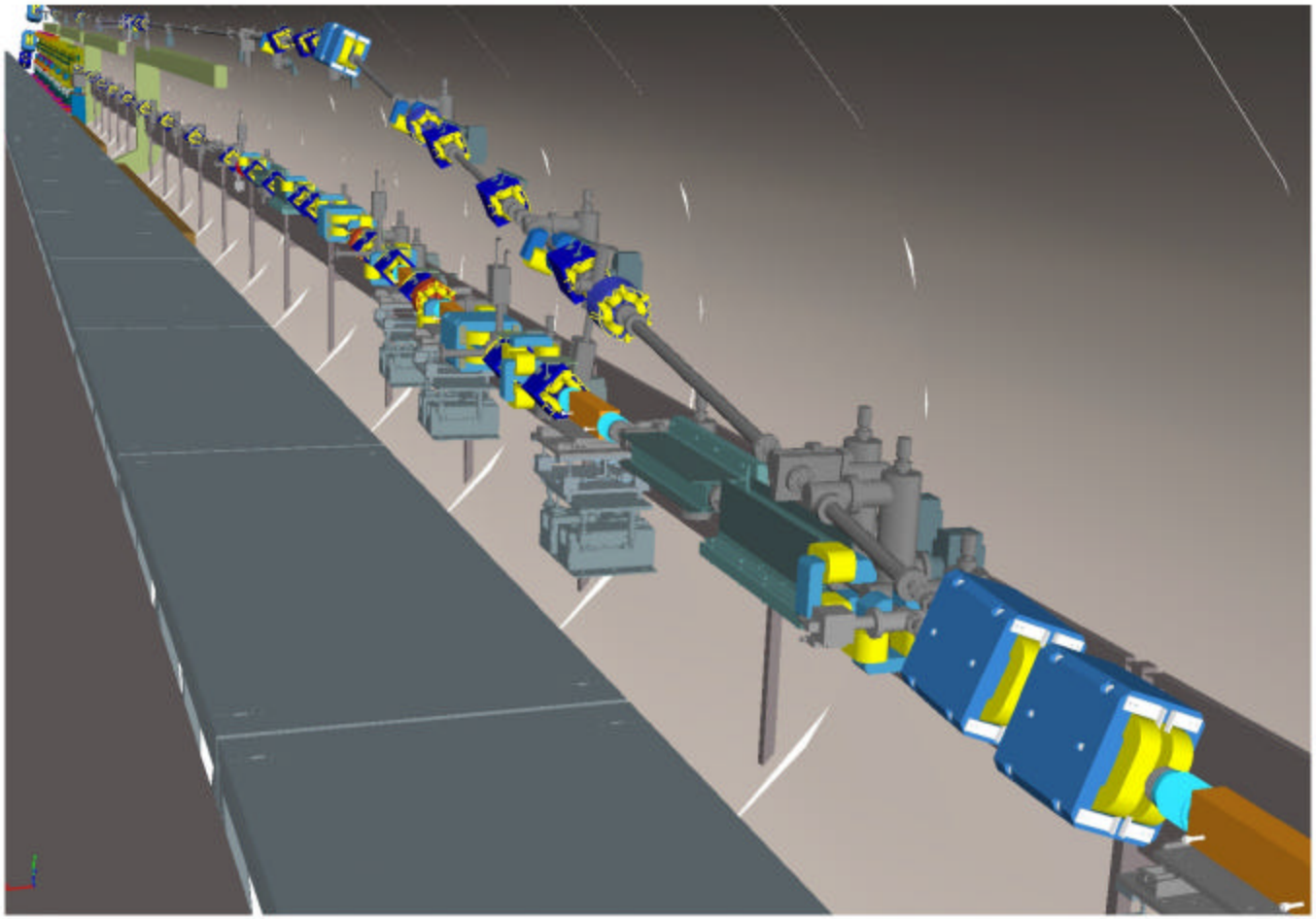
View into the future tunnel



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Power Supplies for TTF2

Magnets	Current	Voltage	Qtty.	Type
QP, DP	200	60/120	25	Buck converter
QP, DP	400	Up to 120	48	Buck converter
Sc. Magnets	Up to +/- 100	+/-10	48	New design
Undulator steerers	+/- 30	+/- 10	30	Linear H-bridge
Steerers	+/-3,5	+/-120	68	Switched on primary
Dump	+/-100	+/-100	3	H-bridge bipolar

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New Challenges

-How can the PS be installed ?

racks / container / cooling

-How can the PS be commissioned?

test of equipment / test of cabling / system test

-What happens in case of failure

accessibility / fast replacement / failure detection

How are the interfaces

connection of power cables / water system / controls

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Developments

- Electronic racks with internal cooling
- Container structure for transportation
- Docking system
- Internal construction inside the electronic rack
- New buck converter
- Redundancy system
- PLC
- Digital/Analog Converter
- Power Supplies for superconducting magnets and correction magnets

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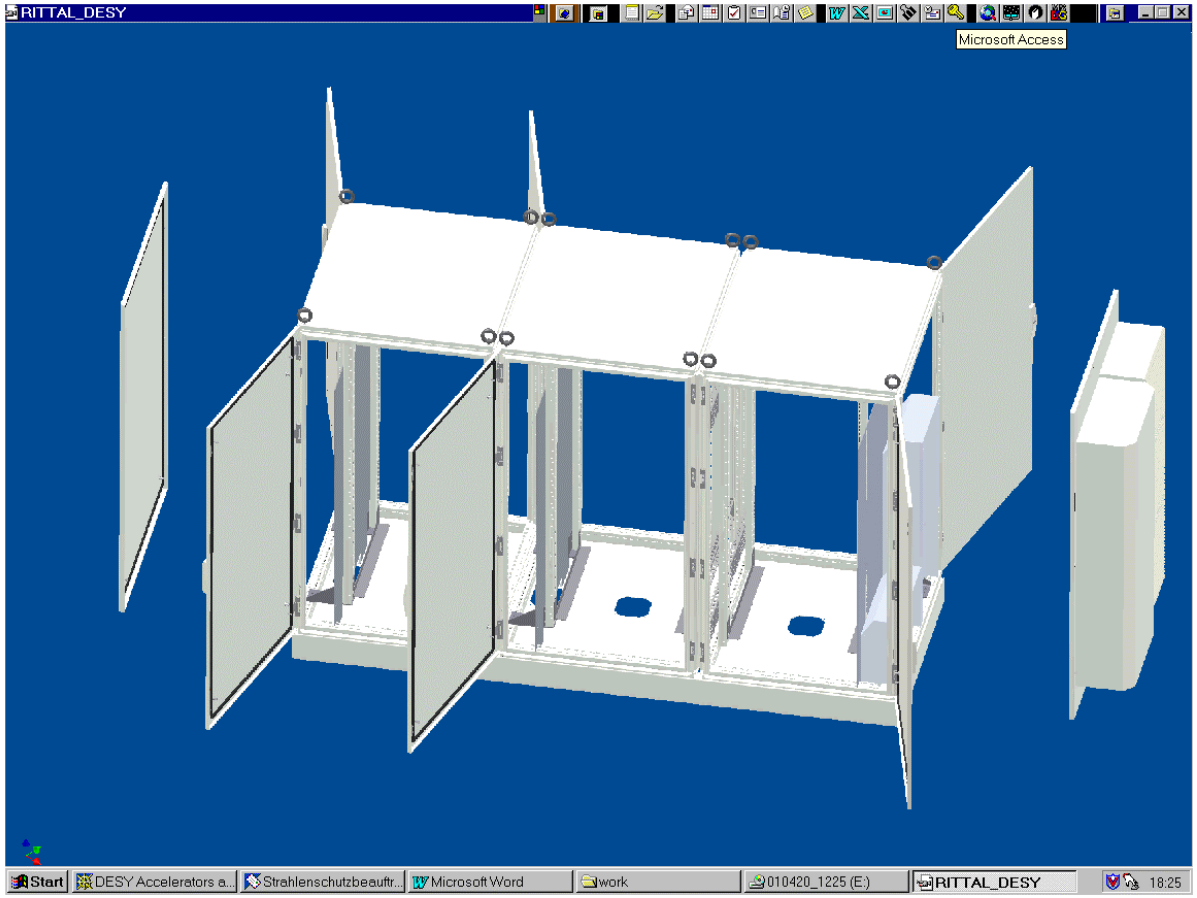
Electronic racks



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Container structure

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Container structure

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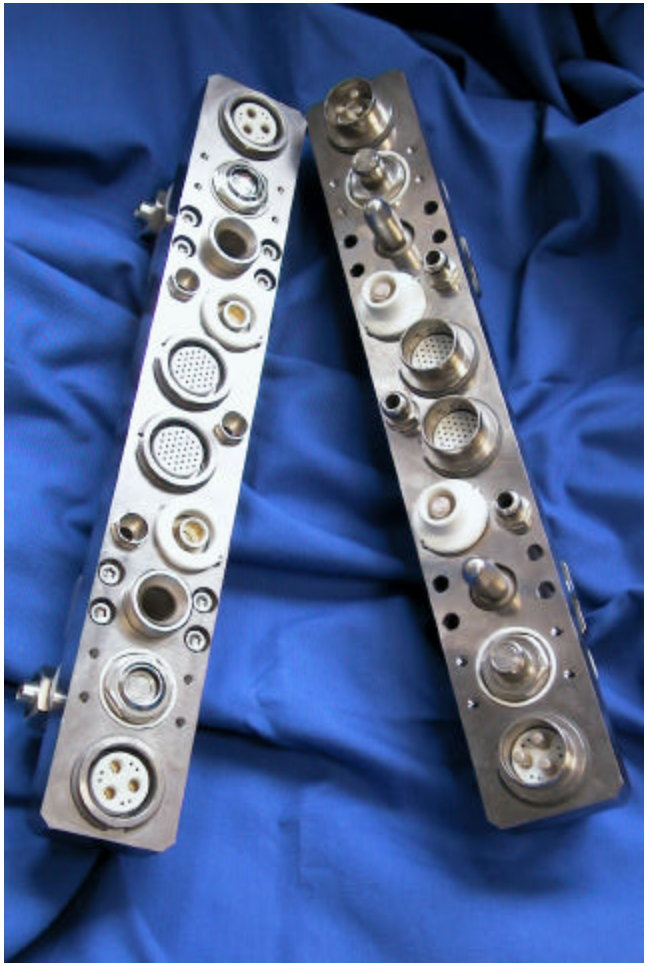
Docking system



Internal construction of the racks

The internal construction of the racks was developed inside the racks are:

- one input circuit breaker and main contactor
- one transformer 400 V/ 45 V, 45 kW
- one diode rectifier
- five power supply units
- five regulation electronics
- ten DC current transformers
- five Power Supply Controller
- one Programmable Logic Controller
- four 400 A switches for disconnecting/connecting spare PS
- busbars
- wiring
- auxiliary components

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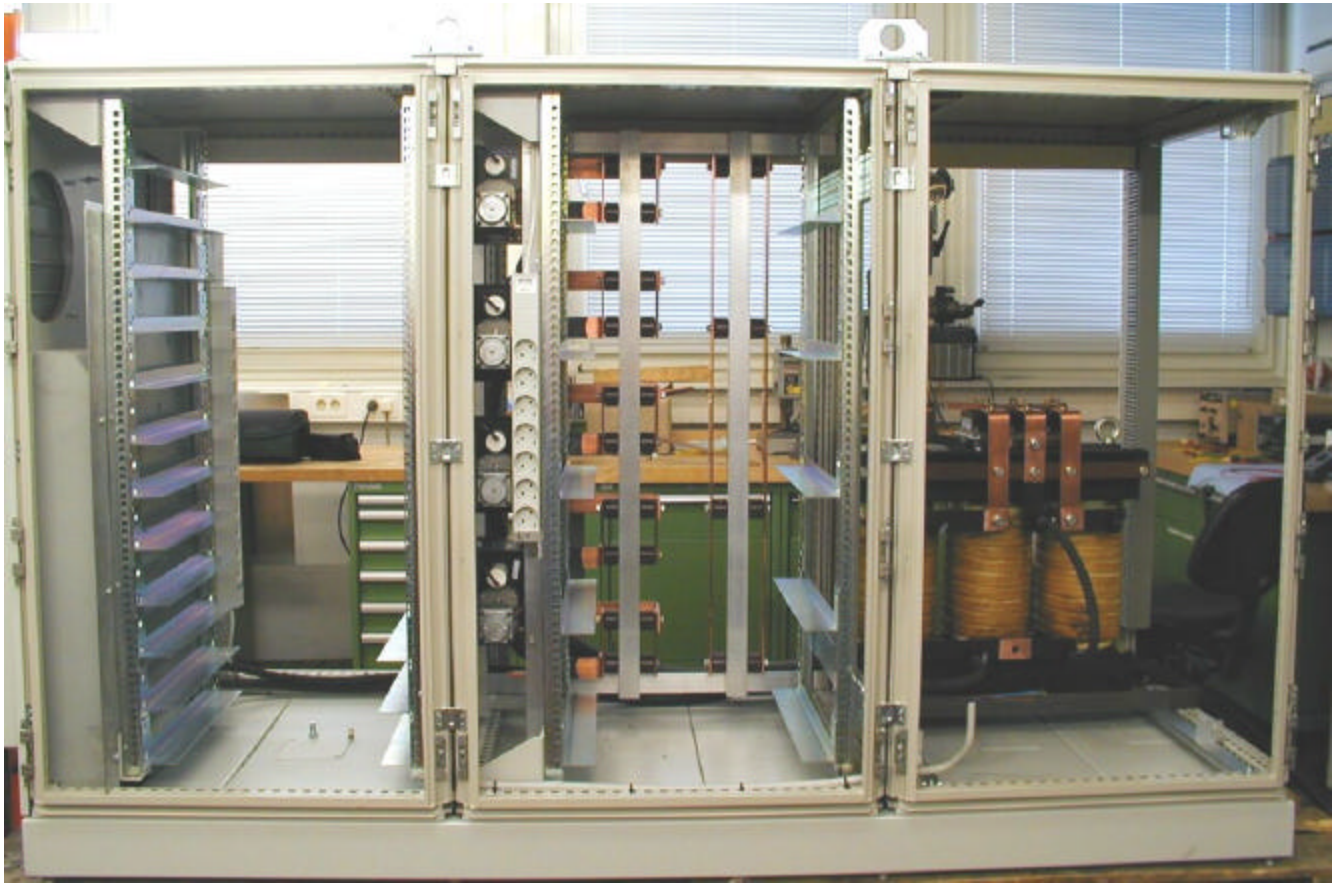
Internal construction of the racks



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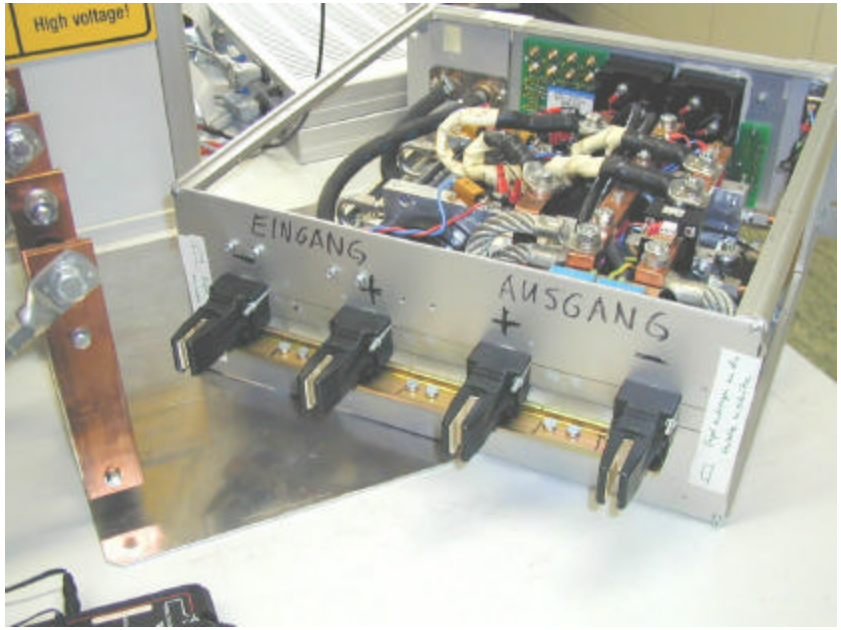
New Buck converter power part
400 A, 60 V



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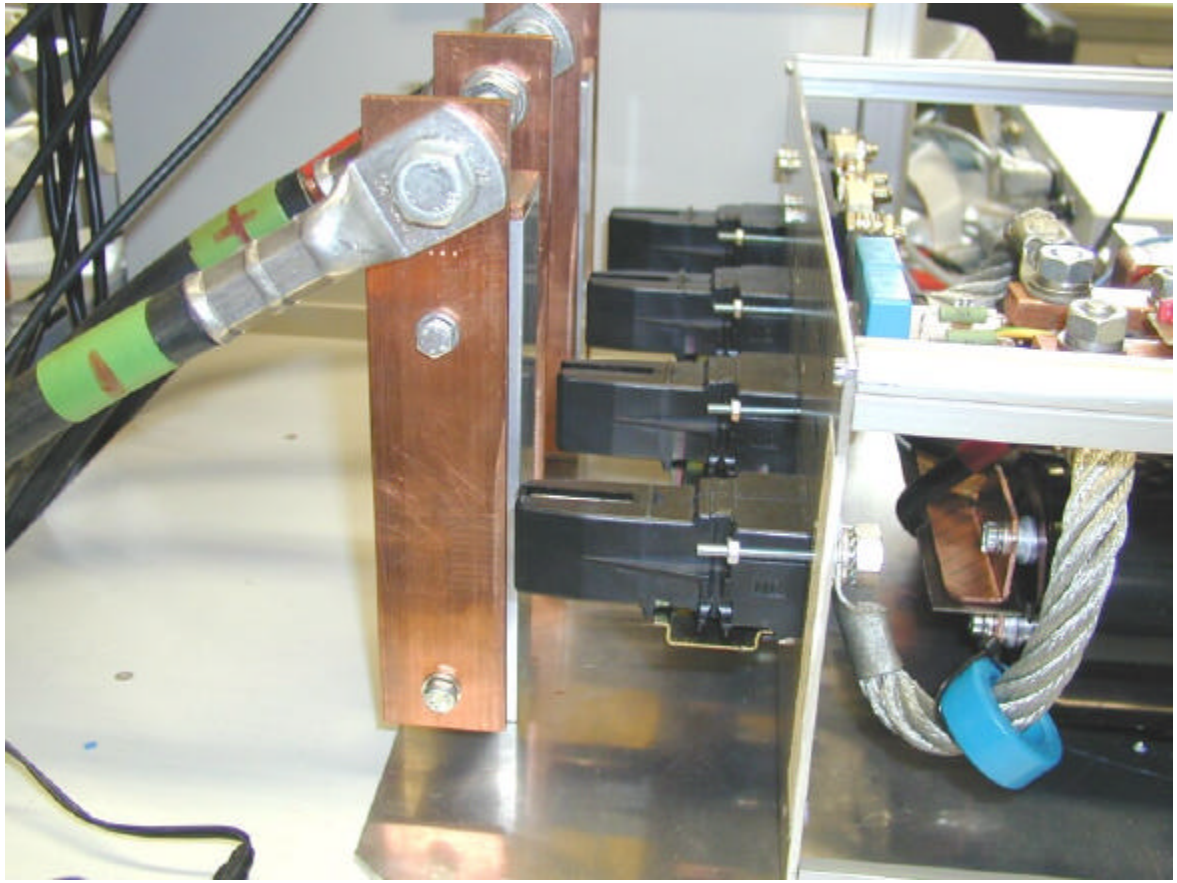
New Buck converter power part



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Redundancy system

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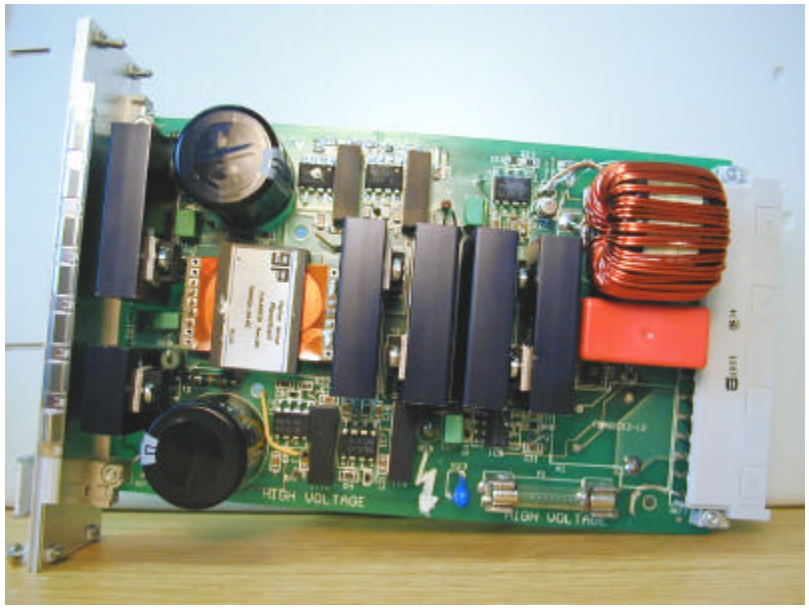
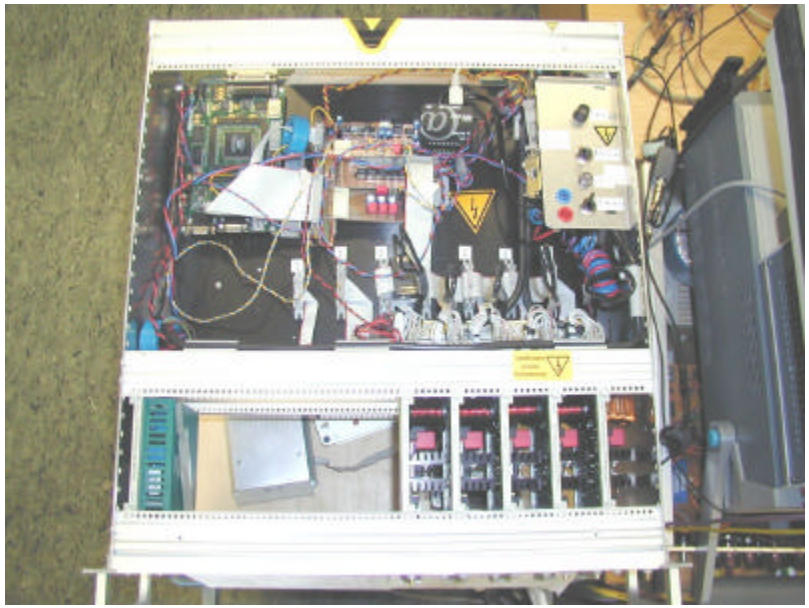
New power supplies for superconducting magnets



Power part of new corrector power supply
+/- 25 A, +/- 10 V



Prototype corrector power supply (topview)
+/- 100 A, +/- 10 V

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Digital/Analog Converter

temperature stability: 1.5 ppm/°C.
compatible to AD 1136.

PLC

The interlocking of the PS as well as the communication with the power supply controller is done via a PLC. A new type for the controls of the container is in development. It based on Siemens S7 and is programmed in STEP 7. There will be one PLC surveying all five power supplies

Commissioning

Usually

- installed in their final position being connected to the magnets.
- The power tests with a test load

  time consuming changes of the cable the tunnel has been secured.

This leads to time pressure

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Commissioning

TESLA

Testing

- test of connections in the tunnel with low voltage
- test of power supplies and container on test stand
  including heat runs
  burn ins

Installation

- transport to the tunnel by truck
- transport inside the tunnel via monorail
- by lowering into position contact via docking system
- final check or transport damages

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Summary

TTF2 is a good training field for TESLA. Principle questions of how to install electronics like power supplies into the tunnel are investigated and solutions are ready. A set of 15 PS will be installed into three containers with electronic racks. Via an automatic docking system the connection of the container is done.

Special Thanks

For TTF2 a lot of developments are going on and planning is done.
Special thanks for the work to the workshops Blöcher, Kovar, Ludwig, Schlegel, R. Hanneken and N. Heidbrook