

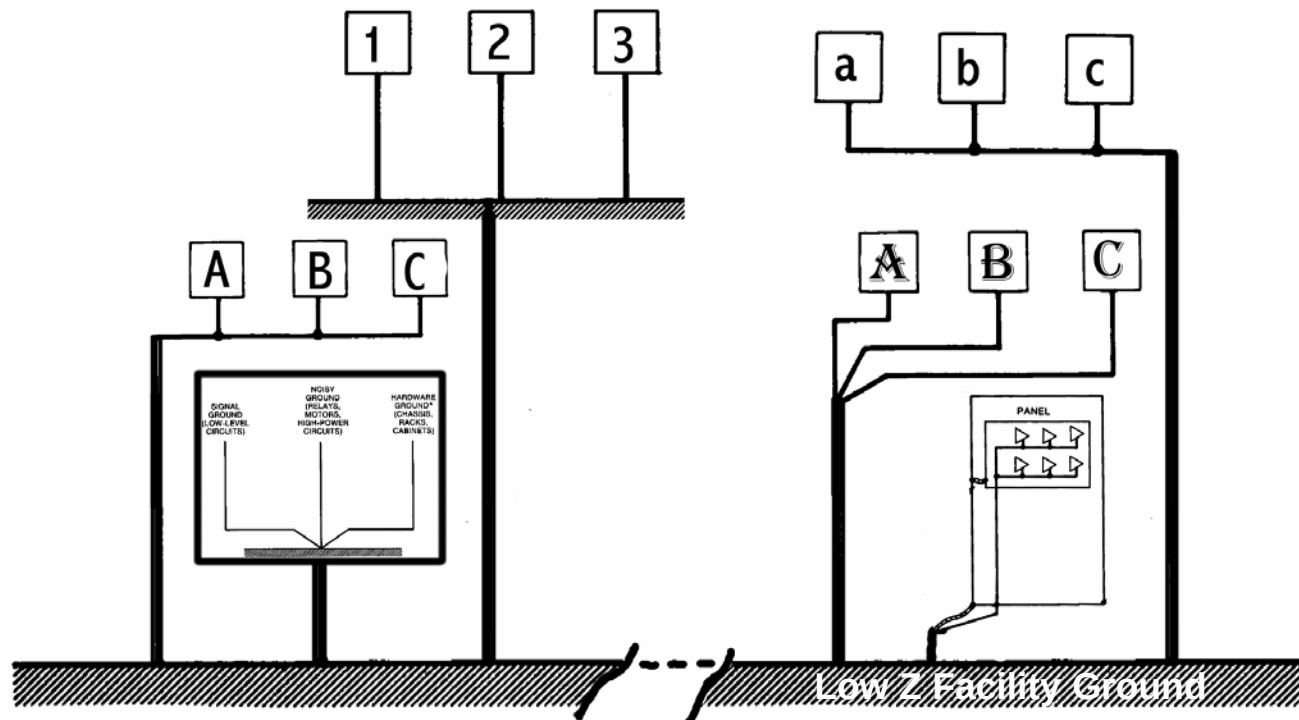
# XFEL Grounding Generalities

H. Kapitza  
XTC Meeting 14.11.06

1. XFEL hybrid ground system
2. Infrastructure to be included in facility ground
3. Local grounding area definition

In a large facility, where many ground conductors would be  $> \lambda / 10$  long, a hybrid multipoint ground system should be used.

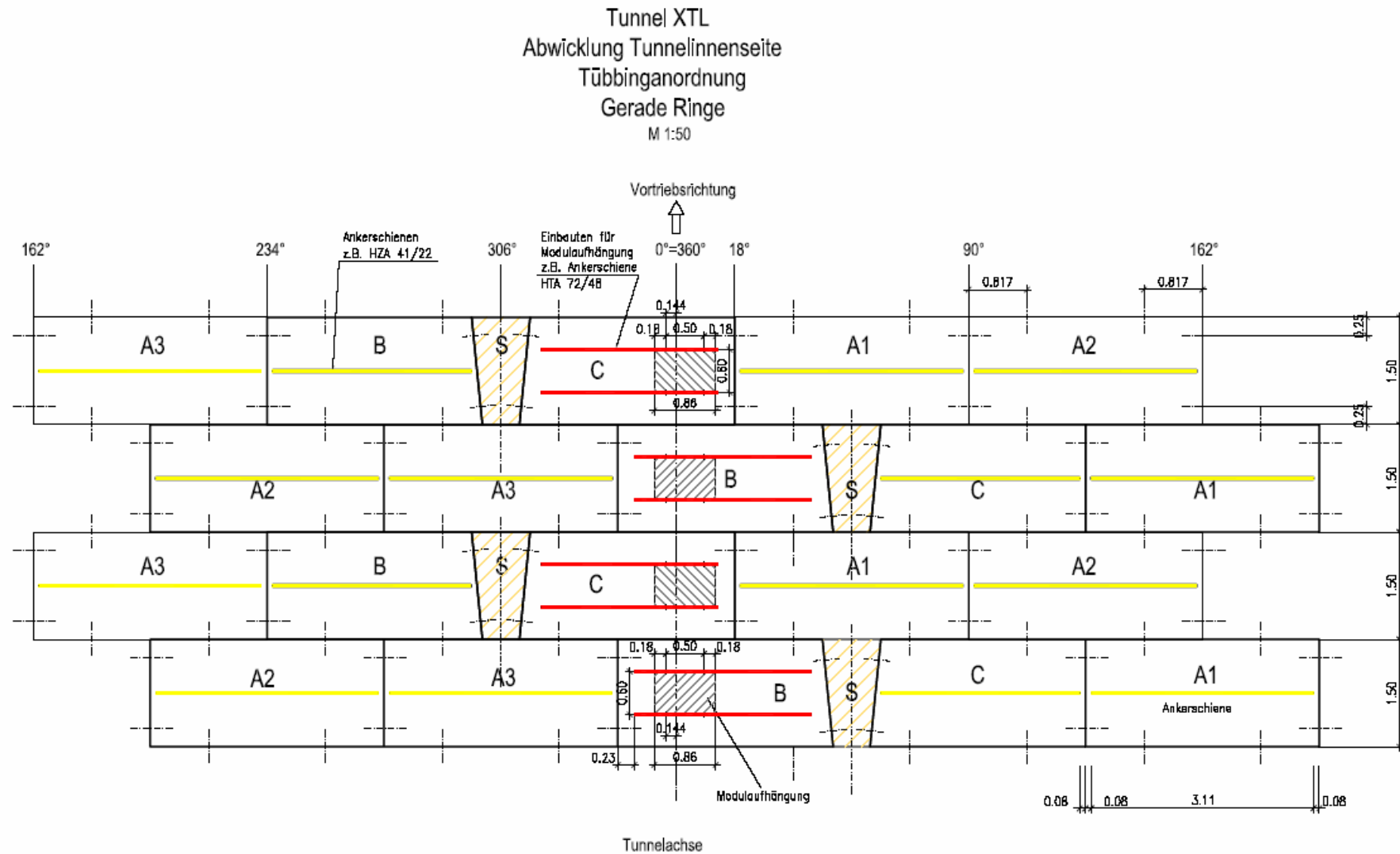
- Local SP ground areas ( $< \lambda / 10$ ) keep ground Z & noise potentials low.
- Cables can be run between local devices (with some restrictions).
- **Grounded cable connections are forbidden between local areas.**  
They won't work well anyway since shield/noise currents will be high.



# XFEL Facility Ground

- Due to its length  $\gg \lambda(2\text{ MHz})/10 = 15\text{ m}$  the XFEL facility needs a **hybrid ground system** where many **local single-point grounding areas** are connected to a **common facility ground**.
- In order to push its **impedance as low as possible**, the common facility ground (plane) should **include as much through-going metal structure as possible** (tubes, pipes, cable trays, remesh,...).
- Since these components will not really form a plane, aim at a **mesh size**  $\approx \lambda(2\text{ MHz})/50 = 3\text{ m}$ .

## Mounting rails in unrolled inner tunnel surface



ANKERSCHIENE MIT  
ANSCHWEISSANKERN

ANSCHWEISSANKER

TÜBBING C40/50  
(BETON C40/50)

INNENLIEGENDE  
TÜBBING-  
HAUPTBEWEHRUNG

TUNNELSCHALE  
INNENFLÄCHE

"QUERSTAB" (MINDESTENS 1 #)  
(VERSCHWEISST MIT HAUPTBEWEHRUNG)

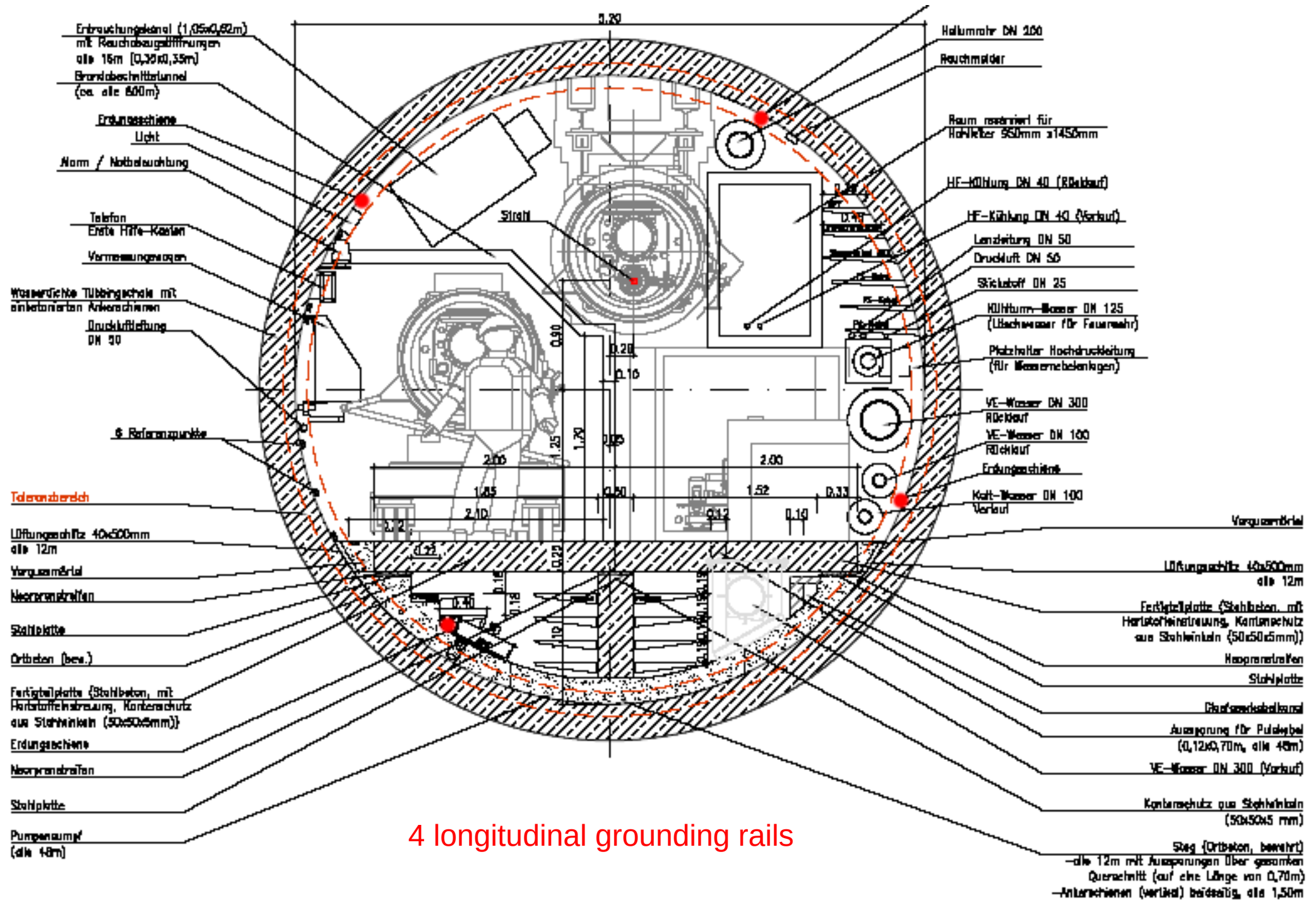
"VERBINDUNGSSTAB" (MINDESTENS 1 #)  
(VERSCHWEISST MIT "QUERSTAB" UND MIT  
MINDESTENS EINEM ANSCHWEISSANKER  
DER ANKERSCHIENE)

TÜBBING-QUERBEWEHRUNG  
NICHT DARGESTELLT

VERBINDUNG ANKERSCHIENE —  
TÜBBING-HAUPTBEWEHRUNG  
(SCHEMATISCH)

N.T.S.

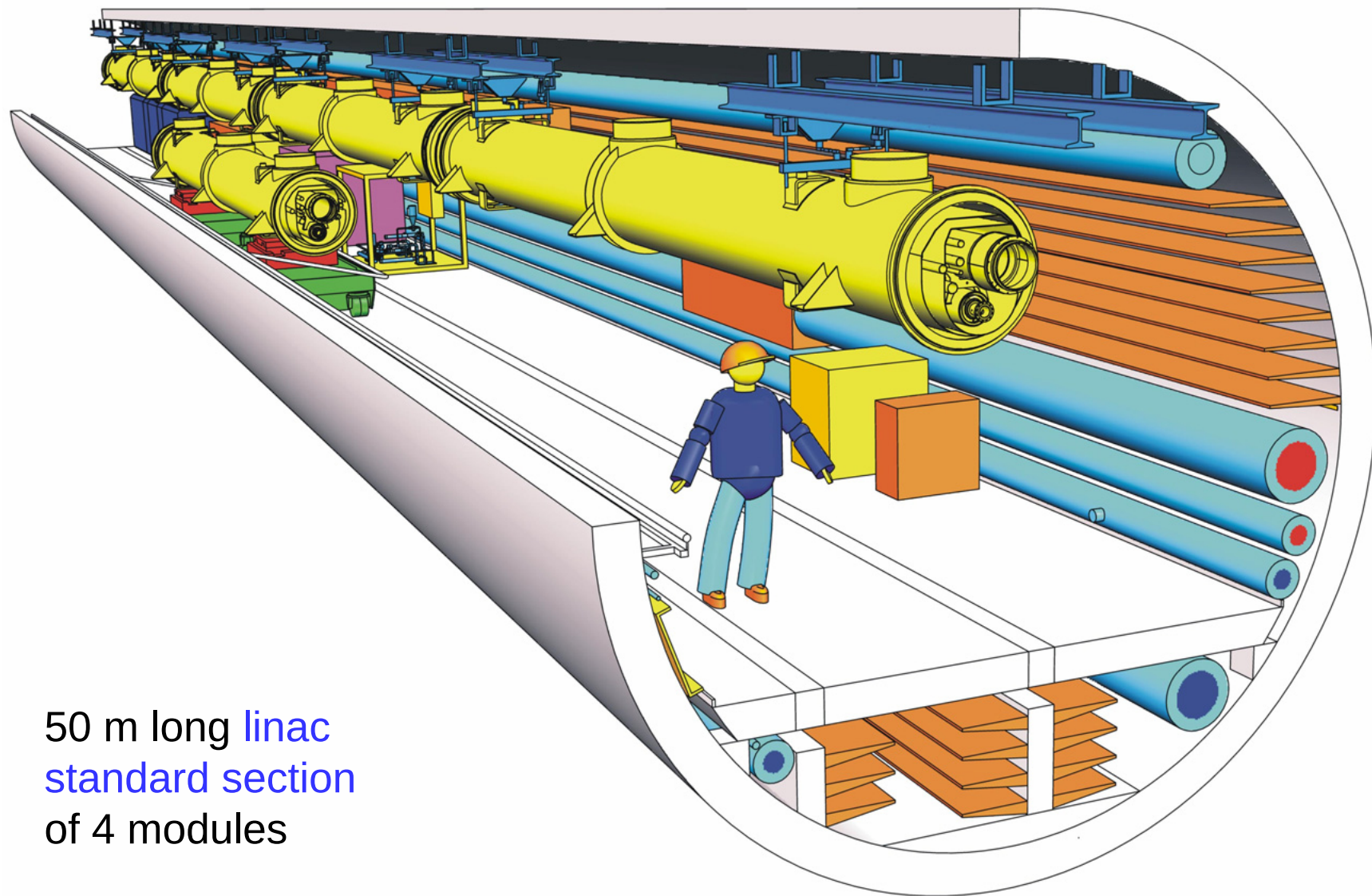
07/04/06 | GPL  
IG-WTM-AMBERG





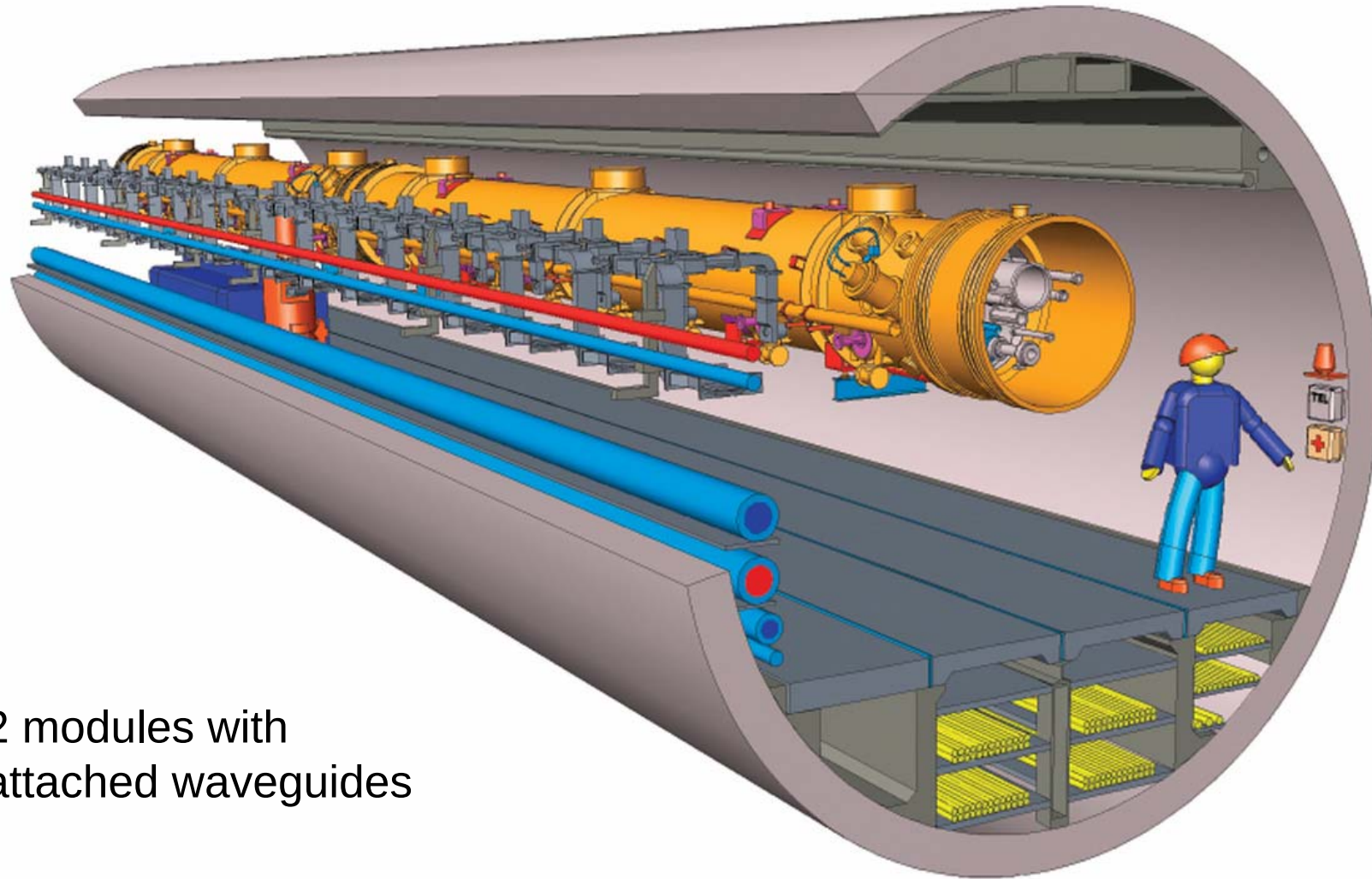
## Inventory of metallic tunnel infrastructure:

- |                     |                |                       |
|---------------------|----------------|-----------------------|
| • Helium pipe       | DN 200         | • 6 cable trays       |
| • 2 RF cooling      | DN 40          | • 4 grounding rails   |
| • suction line      | DN 50          | • wave guides         |
| • 2 compressed air  | DN 50          | • 8 pulse cable trays |
| • nitrogen          | DN 25          | • module housings     |
| • fire water        | DN 125         | • beam tube           |
| • 2 VE water return | DN 300 and 100 |                       |
| • cold water        | DN 100         |                       |
| • VE water          | DN 300         |                       |
| • smoke channel     | 1050 x 620 mm  |                       |
- 
- Collect the **resistances and inductances** of these components.
  - Which are **local**, which are **going through**?
  - **Allocate cable trays according to EMI level**, not according to DESY group.



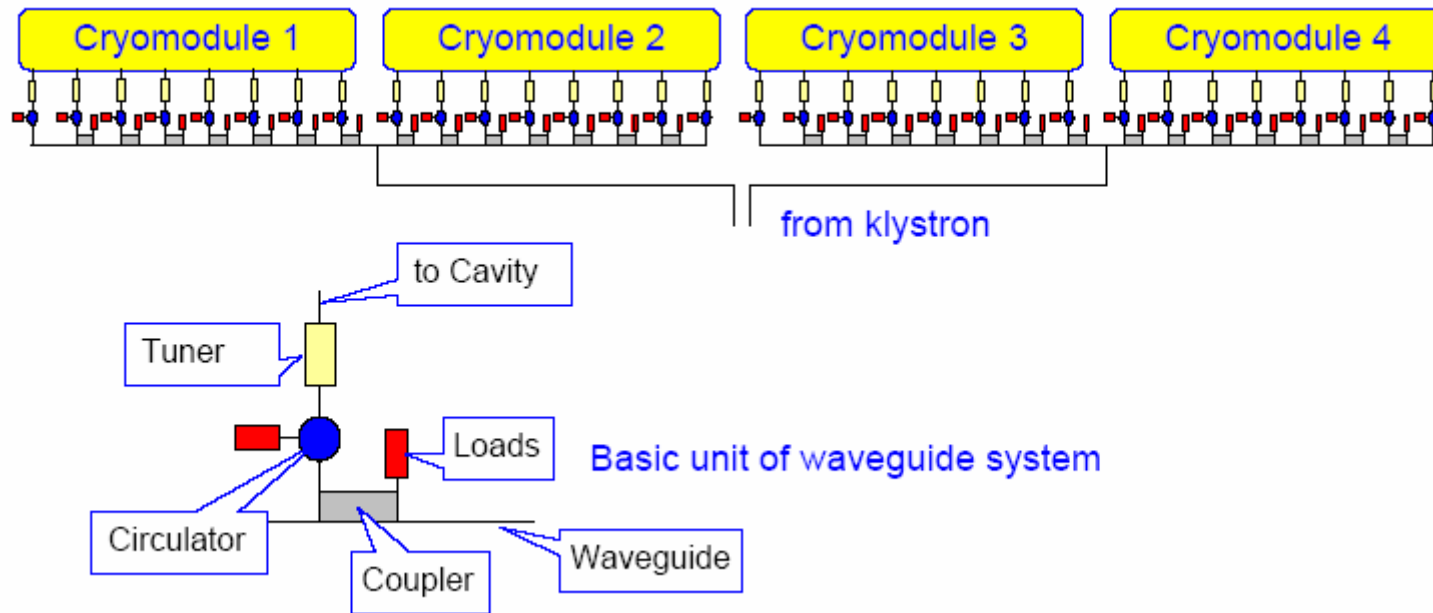
50 m long linac  
standard section  
of 4 modules





2 modules with  
attached waveguides

## RF distribution (schematic):



- Are the waveguides suitable local ground references?

Another type of [local ground system](#) (new sync laser hut)



# Schematic overview of the TESLA XFEL Injector

